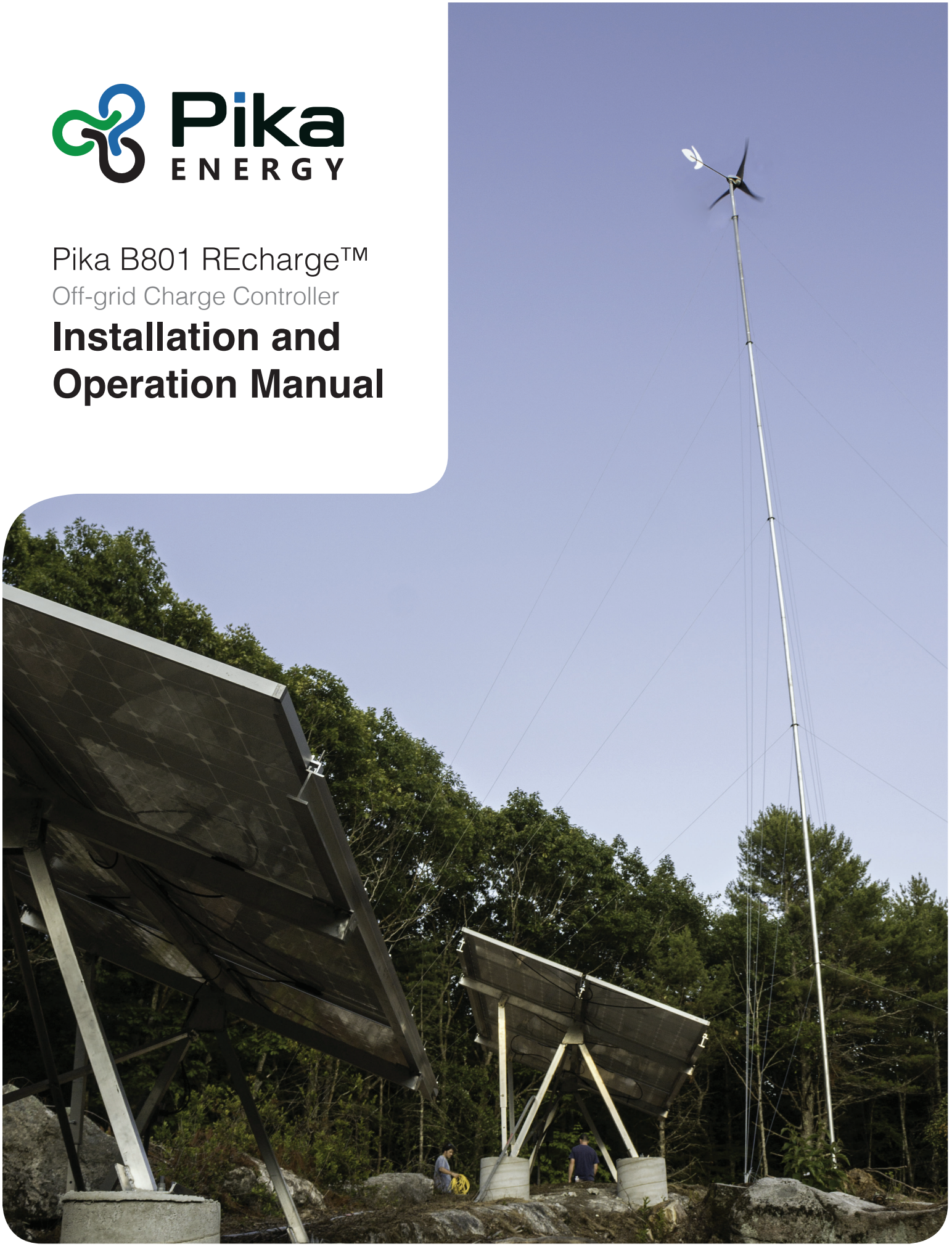
Pika ENERGY

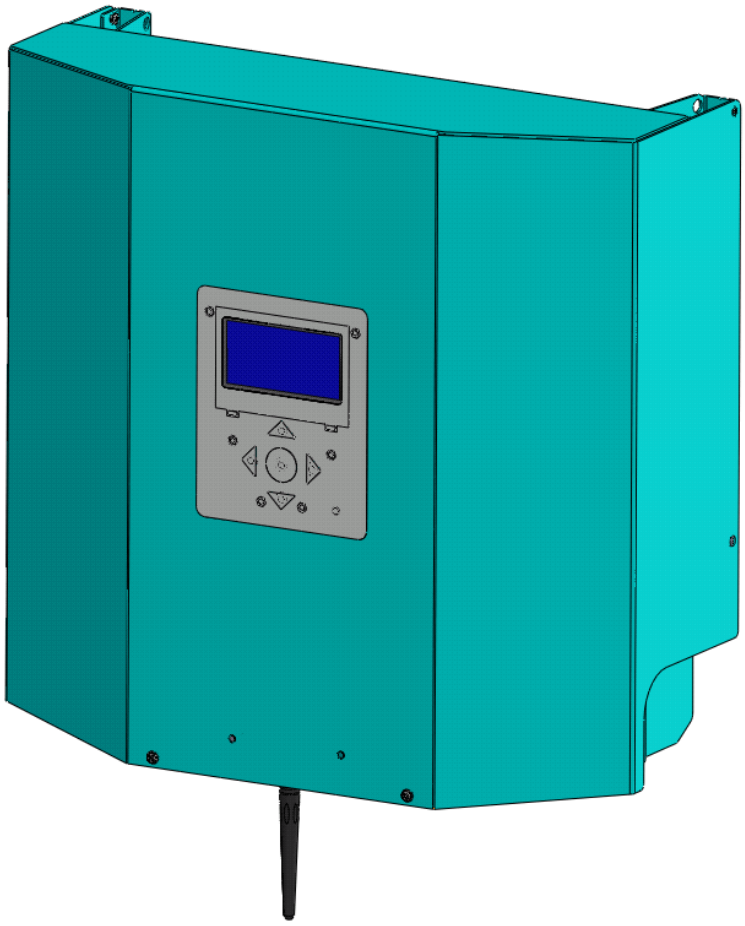
Pika B801 REcharge™

Off-grid Charge Controller

Installation and Operation Manual



Installation & Service Manual for the B801 REbus™ Charge Controller



Revision Table

Revision	Date	Changes
1.	****	Initial Release
1.1	7/30/2015	100A breaker, stud spacing and minor changes

General Remarks

Congratulations! You have purchased the Pika Energy B801 REbus™ bidirectional charge controller, a dependable, efficient component of your clean energy system. The B801 is the result of the Pika team's careful development and testing, building on decades of experience in the fields of power electronics and renewable energy systems.

The B801 is a charge controller designed for high-efficiency bidirectional conversion between a REbus™ Microgrid and a 24V to 48V battery bank at up to 80A. This charge controller is equipped with a small fan to keep things cool under extreme conditions. An illuminated display and intuitive system of menus enable you to configure a variety of setpoints as well as view the energy output of every component of your REbus™ renewable energy system. The charge controller also serves as an information gateway, enabling remote monitoring and control of your REbus™ microgrid system.

Unlike conventional charge controllers, which only connect to one type of energy source, Pika's B801 is designed to operate as the hub for an expandable network of renewable energy devices, based on the REbus™ renewable energy standard.

What is REbus™?

The underlying technology behind Pika Energy's B801 Charge Controller is an innovative energy management technology or 'smart microgrid' called REbus™. REbus™ is a DC energy network that can operate alongside an existing AC infrastructure (i.e. the "grid") or an off-grid DC battery bank infrastructure. This enables customers to build cost-effective, scalable renewable energy systems. The REbus™ network is designed to serve as an open interconnection standard for networking next-generation energy technology – like Wi-Fi or USB for green energy!

IMPORTANT! Only REbus™ compatible components may be used in connection with this charge controller. Do not connect the output of a PV array or any other non-REbus™ electrical source to the charge controller terminals. Serious property damage and/or personal injury may result.

Contents

1 Regarding this Document 4

1.1 Symbols used in this document 4

1.2 Data Label 4

2 Important safety information and instructions 5

2.1 Appropriate Usage 5

2.2 Battery Output Details 5

3 Notes concerning installation and operation 6

3.1 Intended (normal) use 6

3.2 Pika Energy Factory Limited Warranty 6

3.3 Service 8

4 The REbus™ Microgrid 9

4.1 Simple and efficient power distribution 9

4.2 Integrated Power Line Carrier (PLC) communications 9

4.3 REbus™ Control Protocol (RCP) 9

5 Designing a REbus™ system 10

6 Installation 11

6.1 Checking for shipping damage 11

6.2 Charge controller mounting 11

6.3 Electrical connection notes 15

6.4 Batteries 16

6.5 Battery Connection 16

6.6 Accessory Connections 17

6.7 REbus™ DC connection 18

6.8 Wiring the charge controller 18

6.9 Commissioning the charge controller 21

6.10 Operation 21

7 Troubleshooting 22

8 Frequently Asked Questions 23

1 Regarding this Document

This manual contains important instructions for the B801 Charge Controller that must be followed during installation and maintenance of the charge controller. The B801 is designed and tested according to international safety requirements, but as with all electrical and electronic equipment, certain precautions must be observed when installing and/or operating the B801. To reduce the risk of personal injury and to ensure the safe installation and operation of the B801, you must carefully read and follow all instructions, cautions and warnings in this user manual.

Store this manual so that it is always easily accessible.

1.1 Symbols used in this document

WARNING: This indicates a fact or feature very important for the safety of the user to prevent injury or death and/or which can cause serious hardware damage if not applied appropriately.

CAUTION: Presents information to prevent damage to this product

EARTH GROUND SYMBOL

1.2 Data Label

A permanently affixed label indicating the device specifications, serial number, and manufacturing date is located on the bottom surface of the charge controller enclosure. Tampering with label can void warranty.

2 Important safety information and instructions

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions for model B801 that shall be followed during installation and maintenance of the Pika B801 Charge Controller.

WARNING: Before installing the Pika Energy B801 Charge Controller, read all instructions and caution markings in this manual and on the B801 device itself as well as on other REbus™ devices.

WARNING: Electrical installation in the United States shall be done in accordance with all local electrical codes and/or the National Electrical Code (NEC), ANSI/NFPA 70.

WARNING: Electrical installation in Canada shall be done in accordance with all local electrical codes and/or the Canadian Electrical Code.

2.1 Appropriate Usage

The B801 is a charge controller designed for high-efficiency bidirectional conversion between a REbus™ microgrid and a 24V to 48V battery bank. Refer to this charge controller installation manual for detailed information about the product and its intended use. The charge controller may only be operated with REbus™ devices. Do not use the charge controller for purposes other than those described here. Alternative uses, modifications to the charge controller or the installation of components not expressly recommended or sold by the manufacturer void the warranty claims and operating permission. Contact the Pika Energy technical support if you need clarification regarding proper use of the charge controller.

2.2 Battery Output Details

The B801 is to be connected to a 24V or 48V battery bank only. Supported battery chemistries include: flooded lead acid, sealed lead acid (“maintenance free”), AGM, Aqueous Hybrid Ion (AHI) or lithium based chemistries such as Li-ion, lithium polymer or lithium-iron phosphate (with individual balancer circuits). Other chemistries can be supported through customizable setpoints. Contact Pika Energy before using this product with battery chemistries other than those listed above. The input and output circuits are isolated from each other and the enclosure. System grounding to the ground lugs provided in the wiring box is the responsibility of the installer.

3 Notes concerning installation and operation

3.1 Intended (normal) use

Your charge controller is strictly constructed according to approved safety requirements. Improper use may lead to lethal hazards for operators and/or damage to devices and property. Improper use or modification of the B801 may result in serious property damage, personal injury or death.

REBUS™ INPUT ONLY! The B801 is designed to accept regulated direct current (DC) from REbus™-compatible devices (e.g. REbus™-compatible wind turbine, REbus™-compatible PV Link unit). DO NOT CONNECT PHOTOVOLTAIC MODULES DIRECTLY TO THE REBUS™ INPUTS OF THE B801 CHARGE CONTROLLER. DOING SO WILL VOID THE WARRANTY AND MAY DAMAGE THE CHARGE CONTROLLER.

Any use other than the specified intended use shall not be deemed intended or normal use, and may result in property damage, personal injury or death. Pika is not liable for damage or injuries caused by unintended use.

Damage caused by unintended use is at the sole risk of the operator.

“Intended use” shall also include adherence to the operating and installation instructions.

Your trained and authorized installer must obtain all necessary permits and agreements from your local government and your utility company for a legal and code-compliant installation of your REbus™ Smart Microgrid system. See the User Manual for more detail.

3.2 Pika Energy Factory Limited Warranty

Pika Energy LLC (“Pika”) has developed a reliable, efficient charge controller, designated B801 (“charge controller”), that is designed to withstand normal operating conditions when used in accordance with its intended use and in compliance with instructions in the accompanying Installation Manual and User Manual shipped with the unit. The Pika limited warranty (“Limited Warranty”) covers defects in workmanship and materials of the Pika B801 Charge Controller (“Defective Product”) for a period of five (5) years from the date of original purchase of such charge controller at point of sale to the originally-installed end user location (the “Warranty Period”). During the Warranty Period, the warranty is transferable to a different owner as long as the charge controller remains installed at the originally-installed end user location.

During the Warranty Period, if Pika determines through inspection the existence of a defect that is covered by the Limited Warranty, Pika will at its option, either (1) repair or replace the Defective Product free of charge, or (2) provide a credit or refund to the owner of the system at the originally installed end user location in an amount not to exceed the then-current price of (a) a “like kind” charge controller that is available for purchase by the system owner at the time of the Limited Warranty claim, or (b) the original cost of the Pika B801 Charge Controller that is subject to a Limited Warranty claim.

If Pika elects to repair or replace the Defective Product, Pika will, at its option, use new and/or reconditioned parts in repairing or replacing the Defective Product. Pika reserves the right to use parts

or products of original or improved design in the repair or replacement of Defective Product. If Pika repairs or replaces a Defective Product, the Limited Warranty continues on the repaired or replacement product for the remainder of the original Warranty Period or ninety (90) days from the date of Pika's return shipment of the repaired or replacement product, whichever is later. The Limited Warranty covers both parts and labor necessary to repair the Defective Product (if Pika elects to repair the Defective Product), but does not include labor costs related to (i) un-installing the Defective Product or (i) if applicable, re-installing a repaired or replacement product. To the extent applicable, the Limited Warranty also covers the costs of shipping a repaired or replacement product from Pika, via a non-expedited freight carrier selected by Pika, to locations within the United States (including Alaska and Hawaii) and Canada, but not to other locations outside the United States or Canada. The Limited Warranty does not cover, and Pika will not be responsible for, shipping damage or damage caused by mishandling by the freight carrier and any such damage is the responsibility of the freight carrier.

To obtain repair or replacement service, credit or refund (as applicable) under this Limited Warranty, the customer must comply with the following policy and procedure:

- Many problems can be addressed in the field. Prior to returning a product, customer must contact Pika technical support to evaluate and troubleshoot the problem in the original installation setting.
- All Defective Product must be returned with a Return Merchandise Authorization Number (RMA) which customer must request from Pika.
- Requests for RMA must include the following information:
    - Proof-of-purchase of the Defective Product in the form of (1) the dated purchase receipt from the original purchase of the product at point of sale to the end user, or (2) the dated dealer invoice or purchase receipt showing original equipment manufacturer (OEM) status, or (3) the dated invoice or purchase receipt showing the product exchanged under warranty
    - Model number of the Defective Product
    - Serial number of the Defective Product
    - Detailed description of the defect.
    - Shipping address for return of the repaired or replacement product (as applicable).
- All Defective Product authorized for return must be returned in the original shipping container or other packaging that is equally protective of the product.
- The returned Defective Product must not have been disassembled or modified without the prior written authorization of Pika.

Pika charge controllers are designed to withstand normal operating conditions and typical wear and tear when used for their original intent and in compliance with the installation and operating instructions supplied with the original equipment. The Limited Warranty does not apply to, and Pika will not be responsible for, any defect in or damage to any Pika charge controller: (1) that has been misused, neglected, tampered with, altered, or otherwise damaged, either internally or externally; (2) that has been improperly installed, operated, handled or used, including use under conditions for which the product was not designed, use in an unsuitable environment, or use in a manner contrary to the Pika User Manual or applicable laws or regulations; (3) that has been subjected to fire, water, generalized corrosion, biological infestations, acts of God, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Pika charge controller specifications, including high input voltage from generators or lightning strikes; (4) that has been subjected to incidental or consequential damage caused by defects of other components of the system; or (5) if the original identification markings (including trademark or serial number) of such charge controller have been defaced, altered,

or removed. The Limited Warranty does not cover costs related to the removal, installation or troubleshooting of the customer's electrical systems. The Limited Warranty does not extend beyond the original cost of the Pika charge controller.

THE LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIKA AND, WHERE PERMITTED BY LAW, IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT OR WARRANTIES AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION. IN NO EVENT WILL PIKA BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING, WHETHER IN CONTRACT OR TORT, INCLUDING WITHOUT LIMITATION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY PERSONAL INJURY.

To the extent any implied warranties are required under applicable law to apply to the Pika charge controller, such implied warranties shall be limited in duration to the Warranty Period, to the extent permitted by applicable law. Some states and provinces do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply. This Limited Warranty gives the customer specific legal rights, and the customer may have other rights that may vary from state to state or province to province.

3.3 Service

WARNING: Do not attempt to repair the B801 Charge Controller. The charge controller contains no user-serviceable parts.

If the Pika B801 Charge Controller fails, first contact Pika customer service at (207) 887-9105 for troubleshooting help. See the Warranty section for details on terms and conditions for repair or replacement under warranty. You must obtain an RMA (Returned Merchandise Authorization) number prior to returning the unit. Obtain the assistance of a skilled and qualified installer to safely disconnect the charge controller for shipment.

Technical Support Information:

- Support department hours: 9AM to 5PM, Monday – Friday (excluding holidays)
- Phone: (207) 887-9105
- Email: support@pika-energy.com

4 The REbus™ Microgrid

The REbus™ Microgrid is the underlying technology that allows for the efficient and robust interconnection of different types of renewable energy products and loads. This section is informational only and not required knowledge for operation of your Pika B801 Charge Controller.

4.1 Simple and efficient power distribution

The REbus™ Microgrid architecture was designed with renewable energy in mind. A clean-sheet approach to power distribution resulted in the most practical and efficient interconnection technology available. The microgrid operates at variable voltage in a defined band, between +/- 180-200 V relative to ground which simultaneously allows for efficient power transmission, reduced shock hazard, and simplified electronics for a bidirectional converter such as the B801. The variable voltage communicates energy availability to the attached REbus™ devices, which allows for prioritized energy storage and load shedding. The microgrid is designed to support many different types of renewable energy sources and power converters, as well as accommodating DC loads that are presently under development.

4.2 Integrated Power Line Carrier (PLC) communications

The REbus™ microgrid standard also specifies an optional power line carrier communication technology that enables devices on the same microgrid to communicate with one another. The B801 uses this capability to gather information about your system such as the status and energy production of your Pika T701 Wind Turbine or your solar array, which connects to the REbus™ microgrid through the Pika S2001 PV Link.

4.3 REbus™ Control Protocol (RCP)

REbus™ Control Protocol is a communications protocol developed specifically for the transfer of data between REbus™-compatible power converters and data management products. RCP is an open-standard protocol which enables independent developers to interface with REbus™ products and create software and applications to enhance user experience. Please contact the Pika Energy team to learn more about interfacing with RCP.

5 Designing a REbus™ system

Your trained and qualified installer will work with the Pika Energy technical support team to design the right system for your site. Please consult with Pika Energy sales department at (207) 887-9105 or on the web at www.pika-energy.com to find an installer near you.

The Pika Energy products are designed from the ground up for unmatched flexibility. First and foremost, the B801 Charge Controller accepts input from any combination of REbus™-compatible sources. In fact, the B801 Charge Controller supports up to 32 devices on the REbus™ microgrid network, and the automatic power management capability of REbus™ allows the total power rating of sources on the network to exceed the charge controller power rating by up to 2X. As of publication, Pika Energy offers the following REbus™ products in addition to the B801 Charge Controller:

- T701 Wind Turbine
- S2001 PV Link
- X3001 Inverter
- REport Data Monitor

Check the Pika Energy website at http://www.pika-energy.com for the latest selection of REbus™-compatible product offerings.

6 Installation

6.1 Checking for shipping damage

The B801 Charge Controller is thoroughly checked and tested before it is shipped. The charge controllers can be damaged in shipping, despite the carefully designed cardboard packaging.

Please inspect the charge controller thoroughly after it is delivered. If any damage is seen please immediately notify the shipping company. If there is any question about potential shipping damage, contact Pika Energy. Please capture a photograph of the damage if possible.

Do not accept unit if visibly damaged or note visible damage when signing shipping company receipt. Report damage immediately to the shipping company. Do not remove the unit from its packaging. If it is determined that the unit must be returned, a RMA# must be obtained from Pika Energy.

It's never a bad idea to save the original B801 packaging, in the event of a warranty claim you'll be happy to have it!

6.2 Charge controller mounting

The B801 Charge Controller is a powder-coated steel enclosure (see Figure 6.1 for dimensions) rated for indoor use. The charge controller is shipped complete and does not require a separate mounting bracket. The B801 is **not dimensioned to fit on a standard stud spacing**, reference Figure 6.3 Mounting Hole Diagram for accurate mounting dimensions. **Note** that the B801 has a kickstand to hold the lid open on the upper right side of the of the sheet metal enclosure. Do not force the lid closed with the kickstand out!

- The B801 should be mounted out of direct rain, either under a weather proof overhang or indoors.
- Ideally, the charge controller should be restricted from direct sun exposure. This will best prevent power derating due to charge controller heatsink temperatures above 50 C. The maximum ambient temperature is 60 C. See Operations manual for additional details on high temperature operation.
- If feasible, the charge controller should be installed away from areas where animals congregate, as the high frequency (40 kHz) switching of the electronics may disturb them.
- During operation, the charge controller heatsink may be hot and should be situated in locations where it will not be subject to incidental contact.
- To minimize running the fan, make best use of passive cooling system in the Pika B801 by mounting on a flat, smooth, vertical wall.
- Minimum clearances must be maintained, as shown in Figure 6.2 below.

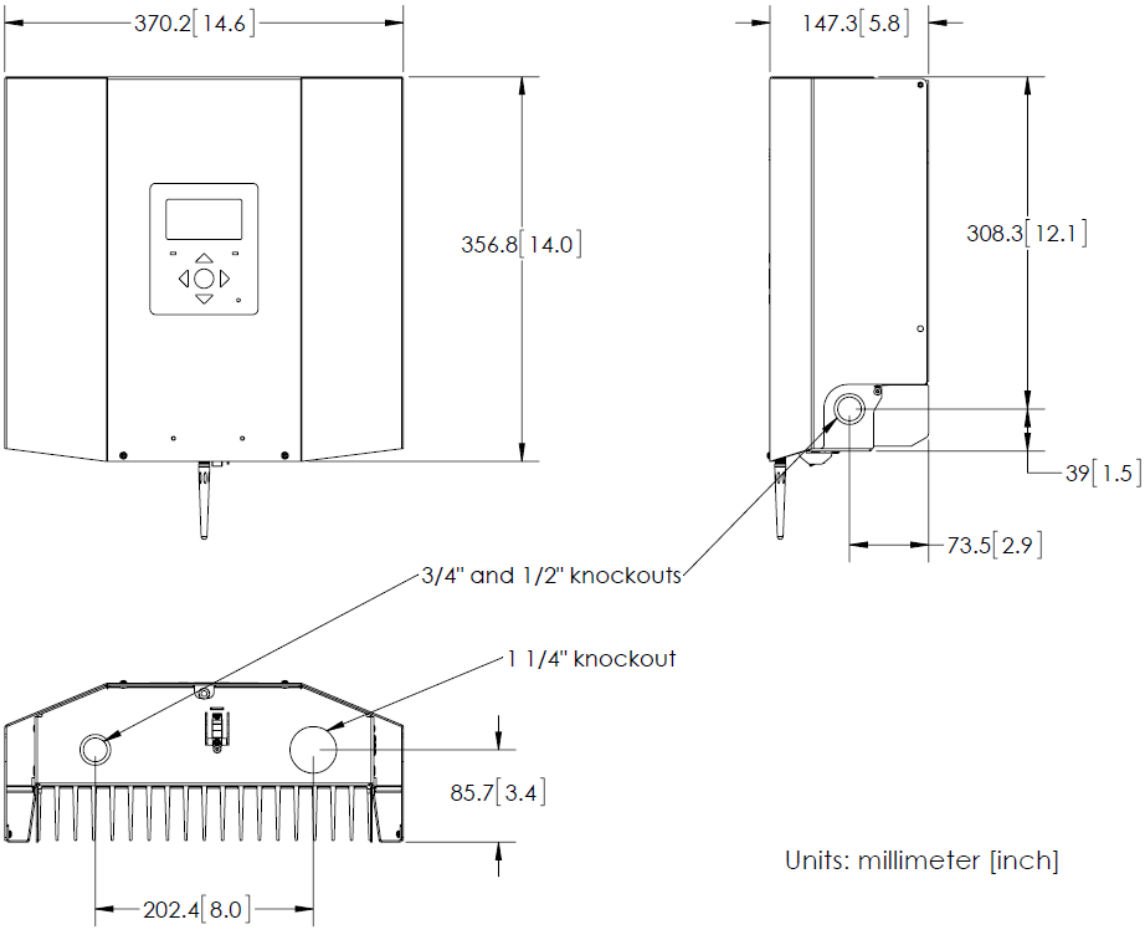


Figure 6.1 Pika B801 Dimensions

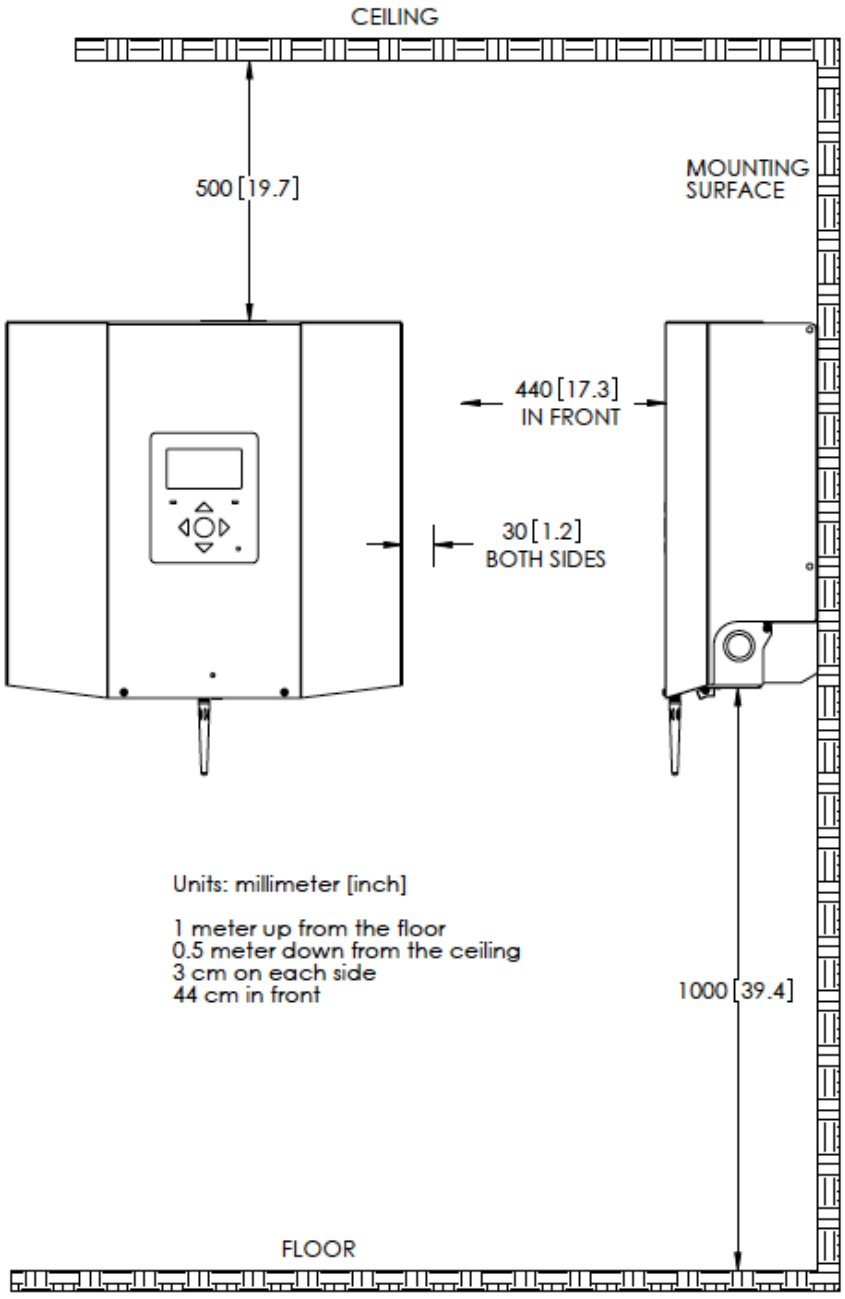


Figure 6.2 Charge Controller Minimum Clearance

Mounting surface must be suitable for installing #10 (~M5) mounting screws (suitable for tightening with screwdriver). These screws can be installed in wood, metal, or masonry. If screw anchors are used (e.g. concrete expansion anchor), they must be rated to hold the 11 kg (25 lb) charge controller with appropriate safety factor. Drywall is not a recommended mounting surface for the charge controller. Mounting surface should be vertical.

Note: The B801 is not dimensioned to mount on a standard stud spacing, additional lumber may be required.

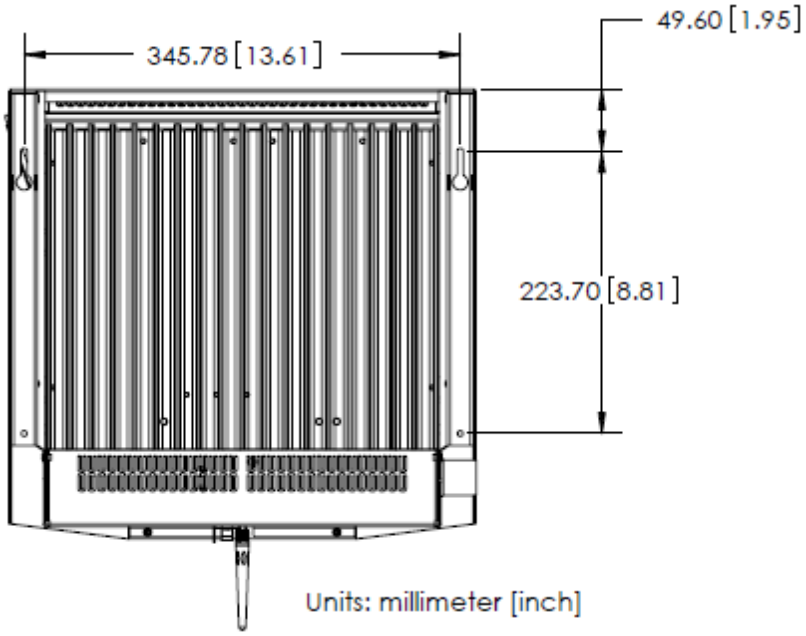


Figure 6.3 Mounting Hole Diagram

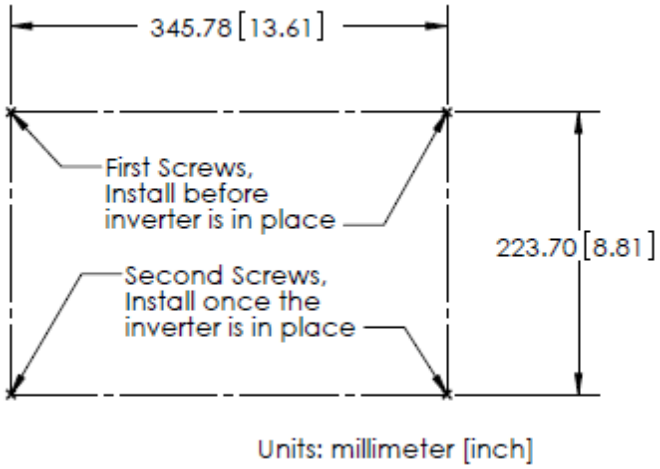


Figure 6.4 Mounting Screw Diagram

Use the included mounting template to accurately mark and drill holes for installing the B801. Install two of the included screws into mounting surface 345.8 mm (13.6 in.) apart as shown in Figure 6.4. Leave a minimum of a 3 mm gap between the head of the screw and the mounting surface to accept the enclosure foot. Install charge controller over these two screws. Remove M3 screws securing charge controller cover and open cover. Install second two #10 (or equivalent) screws in lower mounting holes. Tighten all screws.

6.3 Electrical connection notes

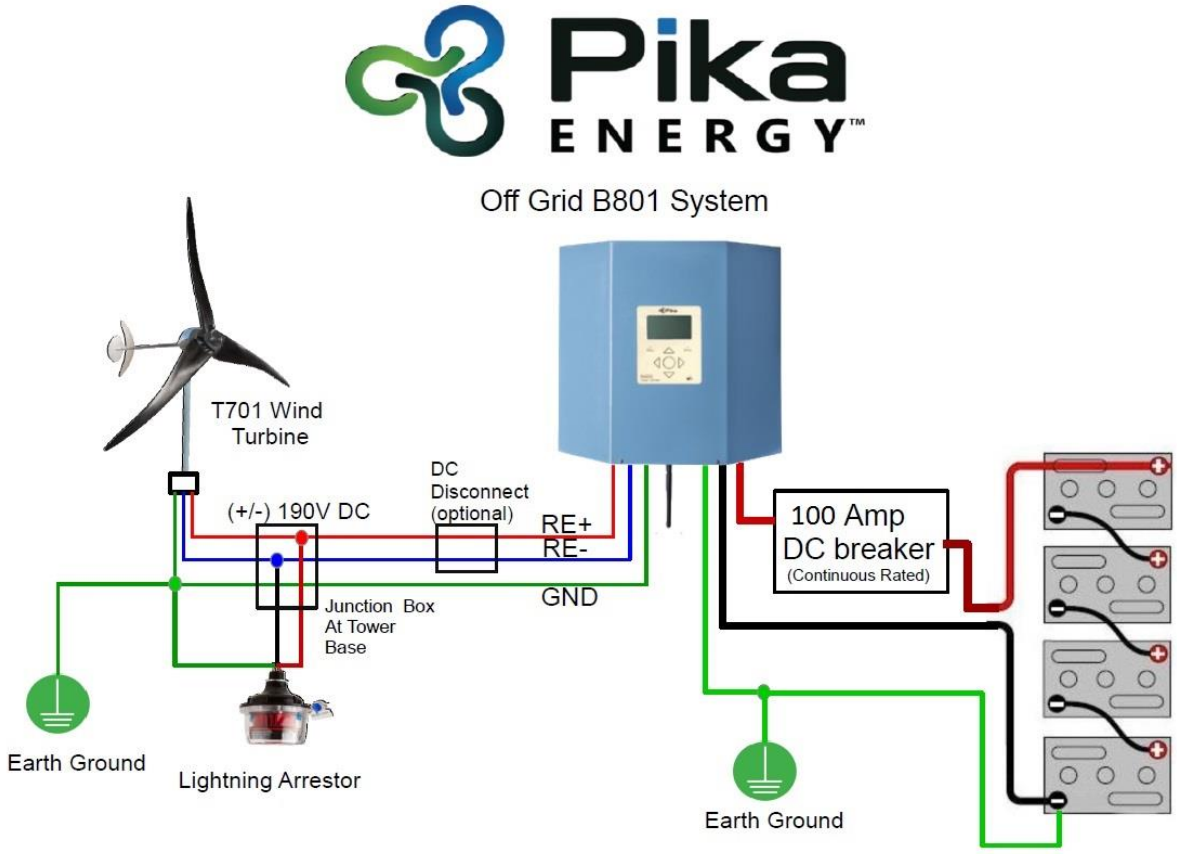


Figure 6.5 Example B801 system with T701 Wind Turbine

WARNING: All electrical installations in the United States shall be done in accordance with all local electrical codes and/or the National Electrical Code (NEC), ANSI/NFPA 70.

WARNING: Electrical installation in Canada shall be done in accordance with all local electrical codes and/or the Canadian Electrical Code.

WARNING: To reduce the risk of fire, always install a dedicated 100A (continuous rated) DC circuit breaker between the charge controller and battery.

The B801 Charge Controller is equipped with concentric electrical knockouts suitable for ½ or ¾" conduit fittings for the REbus wiring compartment as well as a larger knockout for 1 ¼" conduit intended for battery cabling. The B801 ships with reducing washers to accommodate 1" conduit fittings as well. REbus™ DC terminals allow for 14 to 10 AWG copper conductors. Earth ground terminals allow for 14 to 8 AWG copper or aluminum conductors. Battery connection terminals allow for 8-2AWG conductors while accessory wiring terminals accept 20-14 awg.

6.4 Batteries

When designing a battery based system, it is critical to select the proper voltage and capacity batteries for the expected system energy usage. For maximum reliability avoid installing previously used or old batteries. Pika Energy recommends using new batteries when installing a B801 charge controller. Ensure batteries are installed in an area with adequate ventilation and away from potential sources of ignition. A properly constructed battery box is recommended to protect and isolate batteries.

The B801 is to be connected to 24V to 48V battery banks only. Supported battery chemistries include: flooded lead acid, sealed lead acid ("maintenance free"), AGM, Aqueous Hybrid Ion (AHI) or lithium based chemistries such as Li-ion, lithium polymer or lithium-iron phosphate (with individual balancer circuits). Other chemistries can be supported through customizable setpoints. Contact Pika Energy before using this product with battery chemistries other than those listed above.

WARNING: Never short circuit batteries and use extreme caution when making battery terminations. Remember that batteries are **ALWAYS** live; there is no OFF switch for battery terminals.

Use proper terminals for battery jumper wires. Follow all manufacturer guidelines for crimping cable terminals. Use manufacturer recommended techniques and tools for making terminal connections. Test each terminal by pulling to check that terminals are adequately connected to each wire before installation. With proper technique these battery connections will last for years to come but with poor technique they can become a serious hazard. Use insulated tools when making connections to battery terminals.

Use caution and appropriate personal protective equipment when lifting or moving batteries. Do not invert or puncture battery cells, corrosive acid could spill from the battery.

6.5 Battery Connection

The wiring of the battery connections to the B801 must only be done with the wiring disconnected from batteries! Install an 100A DC-rated breaker and ensure it is turned OFF before making connection to the B801! Failure to do this may result in personal injury and/or damage to the battery bank.

WARNING: Always keep the battery disconnect breaker off when connecting the batteries. The disconnect breaker should always break the ungrounded battery conductor.

WARNING: Perform a high potential test on all existing wiring before any connections are made! N**ever trust existing wiring** until a high potential test has been performed. Pika recommends 1kV testing on all REbus™ wiring. Failure to high potential test existing wiring **before** installation will void warranty! For questions concerning high potential testing contact Pika Technical Support.

Battery lugs on the B801 can accept up to 1/0AWG wire, however fine stranded marine grade wire is not recommended without tinning wire ends. Tinning wire ends expands wire and it may not fit in the lugs without forming it with pliers. A minimum of 4AWG wire is recommended for wiring from the charge controller to the batteries. Route cables in the shortest path possible between the charge controller and battery bank. Inspect all battery wire insulation for cracks or fissures, never use wire with brittle compromised insulation. Inspect all battery wiring terminations and distribution blocks to ensure they are sufficiently torqued and corrosion free.

Install a DC breaker rated for 100A (continuous rated) and the appropriate battery voltage in series with the ungrounded battery conductor. Mount the DC breaker in an easy to access location that is clearly labeled. Use of a grounded metal enclosure to house the 100A (continuous rated) DC breaker is recommended.

Multiple B801 units can be used at the same location/facility assuming all codes are followed including NEC, and local building codes. If multiple units are used, each charge controller should have its own dedicated circuit breaker. Contact Pika about configuring the power line carrier communications in applications with adjacent charge controllers.

6.6 Accessory Connections

The B801 has several optional accessories, including an external battery temperature sensor, current shunt and relay outputs. All accessory wiring connections can be made on the 7 terminal block located on the right side of the wiring compartment. The terminals accept wire as large as 14AWG.

The battery temperature sensor utilizes a non-polarized thermistor, connect each end of the temp sensor to the terminals marked “T” as shown in Figure 6.6 B801 Wiring Compartment. Secure the temperature sensor to one of the battery terminals with a bolt for a good thermal connection.

Connect the optional current shunt in series on the battery positive or battery negative between the battery bank and load (inverter,etc). Run the two current sense wires from the shunt to I+ and I-. Wire I+ to the battery side of the current shunt and I- to the load side of the current shunt. Only install a current shunt on the ungrounded battery conductor, otherwise erroneous current readings may result.

A single pole double throw (SPDT) auxiliary relay is available. Normally closed and normally open contacts are accessible from the terminal block and marked as NC and NO respectively. The common terminal is marked CM. When the charge controller is unpowered, the CM terminal will always be connected to the NC terminal. The B801 relay is rated for switching up to 0.5A at 60VDC. The auxiliary relay can be programmed to actuate at user-specified voltages. See B801 Operation Manual for further information on programming the auxiliary relay. The auxiliary relay is **NOT** user replaceable.

6.7 REbus™ DC connection

WARNING: The wiring of the charge controller's REbus™ connections must only be done with the charge controller battery circuit breaker off **and** all REbus™ sources disabled or disconnected. Confirm with a meter that the REbus™ Microgrid is below 20VDC before performing any wiring operations.

WARNING: Hazardous voltage is still present on the REbus™ charge controller after disconnection of all inputs. Allow 3 minutes for the charge controller to discharge the DC voltage completely.

WARNING: Perform a high potential test on all existing wiring before any connections are made! N**ever trust existing wiring** until a high potential test has been performed. Pika recommends 1kV testing on all REbus™ wiring. Failure to high potential test existing wiring **before** installation will void warranty! For questions concerning high potential testing contact Pika Technical Support.

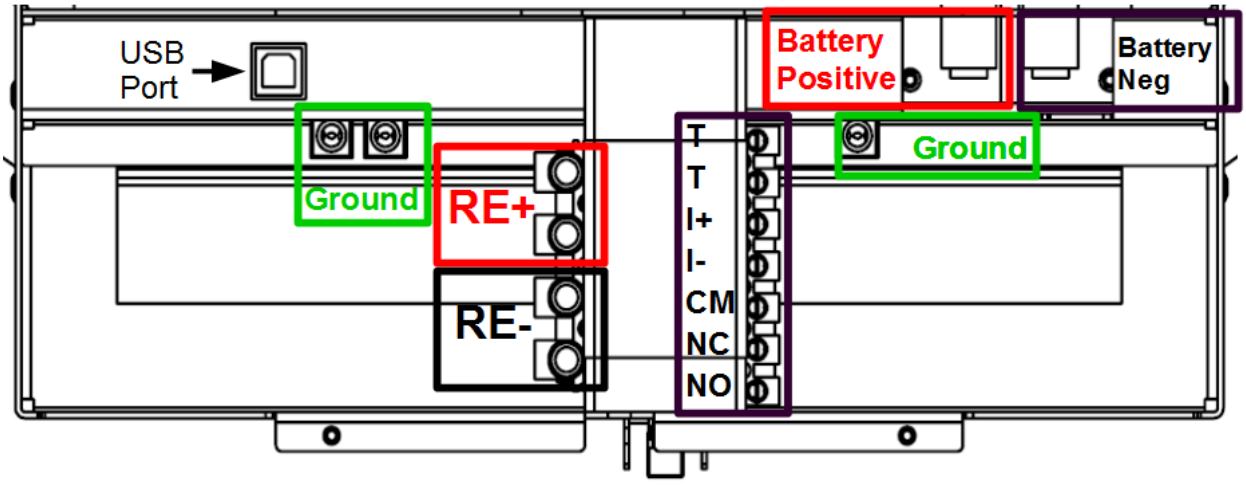


Figure 6.6 B801 Wiring Compartment

6.8 Wiring the charge controller

1. Open charge controller cover by hinging up and then position the kickstand on the right side to catch and support the lid.

2. Remove electrical conduit knockouts, (½" or ¾" for REbus side, 1 ¼" for battery and ½" or ¾" for accessory wiring) on the side or bottom surface of charge controller. Install electrical conduit.
3. The circuit breaker from the batteries to the B801 should be OFF and REbus™ sources (e.g. S2001 PV Link, T701 Wind Turbine) either disconnected or disabled. Confirm with a voltmeter that the REbus™ is below 20 VDC before performing any wiring operations.
4. Connect wires from battery bank to the DC circuit breaker. Ensure the DC circuit breaker is OFF and then to the charge controller. Use caution to not create a short between the battery terminals. Complete one connection at a time and use extreme caution. **DOUBLE CHECK THAT THE BATTERY WIRES ARE ATTACHED TO THE CORRECT TERMINALS!** Torque to 2.1 Nm (18.5 in-lb) using a size M4 hex wrench.
5. (Optional) Complete wiring of other accessories to the accessory terminal block including battery temperature sensor, relay output, etc. Torque to 2.1 Nm (18.5 in-lb) using a flathead screwdriver.

WARNING: Before wiring the REbus™ side of the charge controller, carefully note the following wiring convention:

RE+ : Red wire (alternatively, white wire marked with at least three continuous wraps of red electrical tape at all terminations, as shown below)

RE- : Blue wire (alternatively, black wire marked with at least three continuous wraps of blue electrical tape at all terminations, as shown below)

Ground: Green wire (alternatively, bare wire)

6. Run wires from REbus™ DC sources to charge controller, connect to terminals (reference Figure for wiring locations), torque to 2.1 Nm (18.5 in-lb). See Figure 5.7 REbus™ Wiring Color Code for wiring reference.

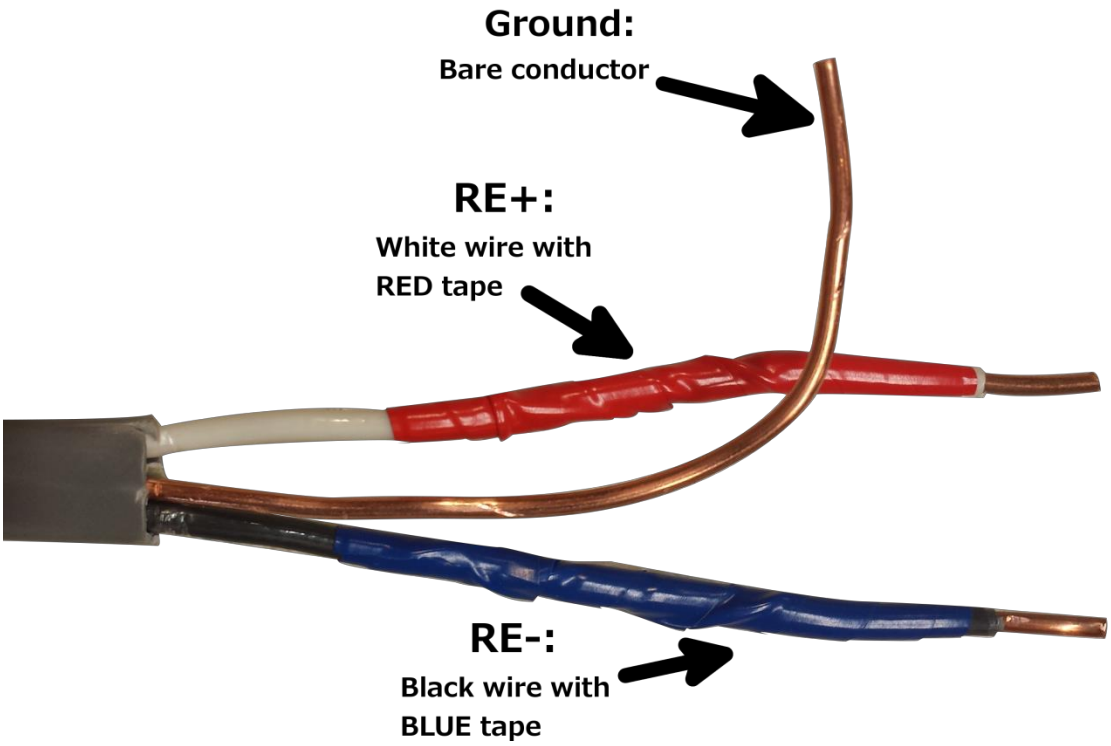


Figure 5.7 REbus™ Wiring Color Code

7. Connect earth ground wires, torque to as follows:

Wire Size	Screw Torque
8 AWG	4.5 Nm (40 in-lb)
10-14 AWG	4.0 Nm (35 in-lb)

WARNING: Make a final check for correctness of all AC and DC wiring to the charge controller and in the system. In particular, check that the polarity of the DC wiring is correct throughout the entire system. **Reverse polarity** will **DAMAGE** system components, may create a fire hazard and will void charge controller warranty!

8. Close charge controller cover and install two cover screws.

6.9 Commissioning the charge controller

Once the charge controller is mounted, and both battery and REbus™ microgrid connections have been made, ensure the charge controller enclosure lid is securely attached with its mounting screws. Ensure no wiring is accessible by personnel (install covers on junction boxes, attach shroud on turbine, etc). The charge controller is now ready to power ON in accordance with the following steps:

1. Turn on the REbus DC disconnect (if the system is equipped with optional DC disconnect)
2. Turn on the battery bank DC circuit breaker.
3. Turn on the power switch on the bottom surface of the charge controller.
4. Watch the LCD for initialization sequence.
5. Use the arrow keys to scroll to the charge controller page. Enable the charge controller by pressing the center button, selecting “Enable” and press “Confirm”. If this is the first time powering up the charge controller, devices connected on REbus™ will be automatically discovered.
6. See the B801 Operation Manual for enabling REbus™ devices, connecting the Wi-Fi and other system configuration.

6.10 Operation

Please consult the Pika B801 User Manual for instruction and important safety precautions related to the operation of your new charge controller. Charge controller operation is best performed by persons who have read and understand the user manual.

7 Troubleshooting

The following table offers a few initial actions to try in the event that the charge controller is not behaving as expected. Contact technical service if the symptoms persist.

WARNING: Disconnect all power to the B801, including sources of DC power before troubleshooting any wiring. Always check wiring with a voltmeter to ensure safe working conditions! Do not open the lid of the charge controller without turning off all sources of power connected to it.

Symptom	**Action**
Unit does not power up	1) Check that DC power from the battery bank is present between 20V-60V at the terminals of the B801. 2) Toggle the power switch on the bottom side of the charge controller
Ground Fault	1) Turn off the optional REbus™ breaker that feeds the charge controller. Disconnect battery bank wiring and the REbus™ side wiring. Ensure REbus™ is electrically insulated using wire nuts or electrical tape. Reconnect battery power to the B801 and turn ON the charge controller. Enable REbus and verify the ground fault message is no longer displayed. If the ground fault is no longer present, check REbus wiring for ground fault. (see step 2). 2) Check the wiring on the REbus™ (DC) side. Ensure that none of the DC wires are touching the enclosure or earth ground wires. RE+ and RE- should measure >1MΩ to ground with a multimeter. Some possible scenarios: incorrect REbus™ wiring, lightning arrestor failed, chaffed wire insulation, or broken wire.
Unit displays waiting state	1) Some fault conditions warrant a 5 minute timeout, if the unit does not return to normal operation after 5 minutes, turn the power switch off, wait 30 seconds and turn it back on again. 2) If unit does not return to normal operation and battery voltage is within correct range, contact Pika technical service.
LCD Screen displays solid black or solid white	1) Turn the unit off using the power switch on the bottom, wait 1 minute and turn it back on again. If this condition does not change, contact Pika Energy.
Charge controller display does not show connected REbus™ devices OR connected devices show status “offline” although	1) Check that ground wire on REbus™ side is connected to the lug in the wiring compartment. There must be a continuous ground wire from the

the charge controller is enabled.	B801 to the other REbus™ devices for communications to work properly. 2) Reseat the cable that attaches the LCD screen to the main board within the B801. Note this is a polarized connector. It may be dislodged during shipping or installation. 3) Call technical support for further troubleshooting.
Charge controller displays devices which are no longer connected to REbus™	1) Delete unwanted devices by selecting "Remove" under the device page. Reference B801 Operations Manual for further detail.

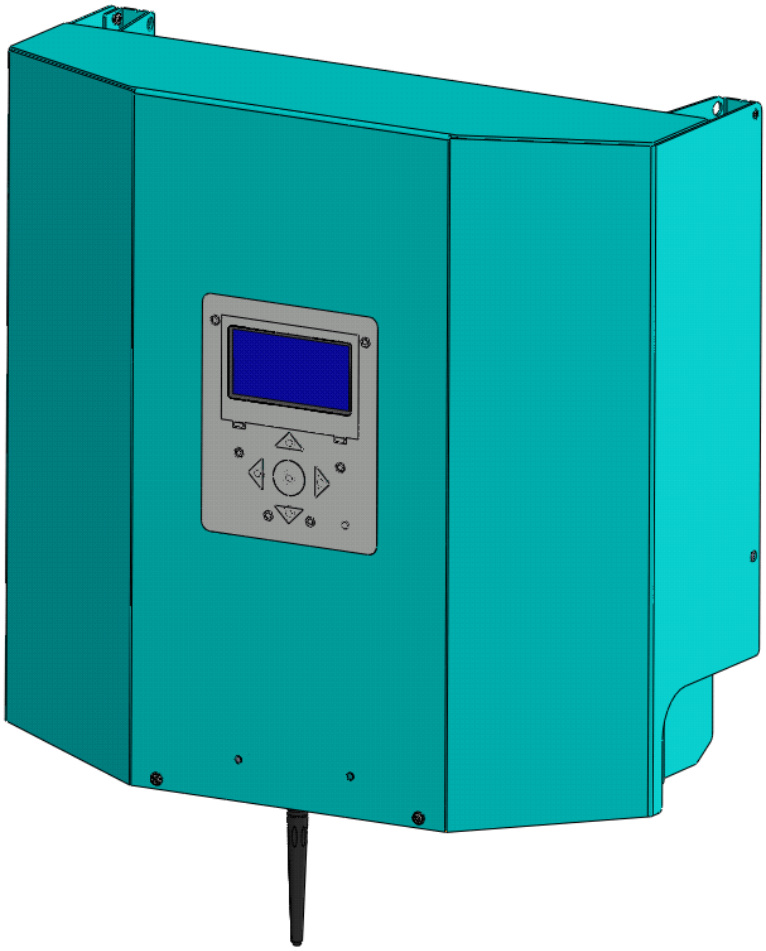
8 Frequently Asked Questions

Do I need to Hi-pot test wire runs?

Hi-pot (high potential) testing is a way of determining if there is an electrical short on wire run. It should **ONLY** be performed by a professional using certified HI-POT test equipment. **ENSURE ALL wires are DISCONNECTED** during hit pot testing. This **INCLUDES the lightning arrestor.** This test should be performed if existing wire will be used in the new installation, newly installed wire need not be tested.

Operation Manual

B801 Bidirectional REbus™ Battery Charge Controller



Revision Table

Revision	Date	Changes
1.0	03/19/2015	Initial Release
1.1	07/30/2015	Setpoint default changes, added FAQs, updated screenshots, added aux function descriptions and diagrams

General Remarks

Congratulations! You have purchased the Pika Energy B801 Bidirectional REbus™ Charge Controller, a dependable, efficient component of your clean energy system. The B801 is the result of the Pika team's careful development and testing, building on decades of experience in the fields of power electronics and renewable energy systems.

The B801 is a charge controller designed for high-efficiency bidirectional conversion between a REbus™ Microgrid and a 24V to 48V battery bank. This charge controller is equipped with a small fan to keep things cool under extreme conditions. An illuminated display and intuitive system of menus enable you to configure a variety of setpoints as well as view the energy output of every component of your renewable energy system. The charge controller also serves as an information gateway, enabling monitoring and control of your entire renewable energy system.

Unlike conventional charge controllers, which only connect to one type of energy source, Pika's B801 is designed to operate as the hub for an expandable network of renewable energy devices, based on the REbus™ renewable energy standard.

What is REbus™?

The underlying technology behind Pika's B801 charge controller is an innovative energy management technology or 'smart microgrid' called REbus™. REbus™ is a DC energy network that enables customers to build cost-effective, scalable renewable energy systems. The REbus™ network is designed to serve as an open interconnection standard for networking next-generation energy technology – like Wi-Fi or USB for green energy!

IMPORTANT! Only REbus™ compatible components may be used in connection with this charge controller. Do not connect the output of a PV array or any other non-REbus™ electrical source to the charge controller terminals. Serious property damage and/or personal injury may result.

Contents

Revision Table 0

General Remarks 1

1 Regarding this Document 4

1.1 Symbols used in this document 4

1.2 Data Label 4

2 Important safety information and instructions 5

2.1 Appropriate Usage 5

2.2 Supported Battery Types 6

3 Notes concerning installation and operation 6

3.1 Intended (normal) use 6

3.2 Pika Energy Factory Limited Warranty 6

3.3 Service 6

4 The REbus™ Microgrid 7

4.1 Simple and Efficient Power Distribution and Management 7

4.2 Integrated Power Line Carrier (PLC) Communications 7

4.3 REbus™ Control Protocol (RCP) 7

5 Designing a REbus™ System 8

6. User Interface 8

6.1 Overview of User Interface 8

6.2 LED Displays 8

6.2.1 Multicolor “REbus™” LED 8

6.2.2 Multicolor “Battery” LED 8

6.2.3 Blue “Wi-Fi” LED 9

6.3 LCD Display 9

6.3.1 REbus™ System Page 9

6.3.2 B801 Charge Controller Page 10

6.3.3 Wi-Fi Status Page 14

6.3.4 Other REbus™ Device Pages 15

6.3.5 Background Illumination 16

7 Operation 16

7.1 Installation 16
7.2 Power Switch 16
7.3 Enable/Disable 16
7.4 Charging Stages 17
7.4.1 Terms 17
7.4.2 Bulk 17
7.4.3 Absorption 17
7.4.4 Float 17
7.4.5 Equalize 17
7.5 Battery Voltage Limits 18
7.5.1 Low Battery Voltage 18
7.5.2 Error Low Battery Voltage 18
7.5.3 High Battery Voltage 19
7.6 High Temperature Operation 19
7.7 Configurations 19
8 Internet Compatibility 22
8.1 Wi-Fi Antenna 23
8.2 Configuring your Wi-Fi Connection 23
8.2.1 Scan-based network setup 23
8.2.2 Add network setup 24
8.3 Wi-Fi Status Messages and Troubleshooting 25
8.3.1 Connection states: 25
8.3.2 Connection state messages: 26
8.4 Pika account and the REview™ online monitoring system 27
9 Included Hardware and Auxiliary Functionality 28
9.1 Auxiliary Functionality 28
9.1.1 Auxiliary Relay 28
9.1.2 Current Shunt Sensor 29
9.1.3 Battery Temperature Probe 29
9.3 WiFi Antenna 30
9.4 Device ID Card 31
10 Maintenance 31

10.1 Battery Maintenance 31
10.2 Handling Errors and Faults 31
11 Troubleshooting Guide 32
12 Frequently Asked Questions 34
13 Specifications 35

1 Regarding this Document

This manual contains important instructions for the B801 Charge controller that must be followed during installation and maintenance of the charge controller. The B801 is designed with safety in mind, but as with all electrical and electronic equipment, certain precautions must be observed when installing and/or operating the B801. To reduce the risk of personal injury and to ensure the safe installation and operation of the B801, you must carefully read and follow all instructions, cautions and warnings in this user manual.

Store this manual so that it is always easily accessible.

1.1 Symbols used in this document

WARNING: This indicates a fact or feature very important for the safety of the user to prevent injury or death and/or which can cause serious hardware damage if not applied appropriately.

CAUTION: Presents information to prevent damage to this product

EARTH GROUND SYMBOL

1.2 Data Label

A permanently affixed label indicating the device specifications, serial number, and manufacturing date is located on the bottom surface of the charge controller enclosure. Tampering with the label can void warranty.

2 Important safety information and instructions

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions for model B801 that shall be followed during installation and maintenance of the Pika B801 Charge controller.

WARNING: Before installing the Pika Energy B801 Charge controller, read all instructions and caution markings in this manual and on the B801 as well as on other REbus™ devices.

WARNING: Electrical installation in the United States shall be done in accordance with all local electrical codes and/or the National Electrical Code (NEC), ANSI/NFPA 70.

WARNING: Electrical installation in Canada shall be done in accordance with all local electrical codes and/or the Canadian Electrical Code.

2.1 Appropriate Usage

The B801 is a charge controller designed for high-efficiency bidirectional conversion between a REbus™ DC Microgrid and a 24V to 48V battery bank. Refer to the charge controller installation manual for detailed information about the product and its intended use. The charge controller may only be operated with REbus™ devices. Do not use the charge controller for purposes other than those described here. Alternative uses, modifications to the charge controller or the installation of components not expressly recommended or sold by the manufacturer void the warranty claims and operating permission. Contact Pika Energy technical support if you need clarification regarding proper use of the charge controller.

2.2 Supported Battery Types

The B801 is to be connected to a 24V to 48V battery bank, contact Pika support for information regarding other battery voltages. Supported battery chemistries include: flooded lead acid, sealed lead acid ("maintenance free"), AGM, NiFe (Nickel-Iron), aqueous hybrid ion and lithium based chemistries. Lithium-based chemistries including Li-ion, lithium polymer and lithium-iron phosphate may require individual balancer circuits and special setpoint adjustments. Contact Pika Energy before using the B801 with Lithium-based battery chemistries.

3 Notes concerning installation and operation

3.1 Intended (normal) use

Your charge controller is strictly constructed according to approved safety requirements. Improper use may lead to lethal hazards for operators and/or damage to devices and property. Improper use or modification of the B801 may result in serious property damage, personal injury or death.

REBUS™ INPUT ONLY! The B801 is designed to accept regulated direct current (DC) from REbus™-compatible devices (e.g. REbus™-compatible wind turbine, REbus™-compatible PV Link unit). DO NOT CONNECT PHOTOVOLTAIC MODULES DIRECTLY TO THE REBUS™ INPUTS OF THE B801 CHARGE CONTROLLER. DOING SO WILL VOID THE WARRANTY AND MAY DAMAGE THE CHARGE CONTROLLER.

Any use other than the specified intended use shall not be deemed intended or normal use, and may result in property damage, personal injury or death. Pika is not liable for damage or injuries caused by unintended use.

Damage caused by unintended use is at the sole risk of the operator.

"Intended use" shall also include adherence to the operating and installation instructions.

Your trained and authorized installer must obtain all necessary permits and agreements from your local government and your utility company for a legal and code-compliant installation of your REbus™ Smart Microgrid system. See the User Manual for more detail.

3.2 Pika Energy Factory Limited Warranty

The Pika limited warranty covers defects in workmanship and materials of the Pika B801 Charge Controller for a period of five (5) years from the date of original purchase of such charge controller at point of sale to the originally-installed end user location. Contact Pika Energy Support for warranty claim information.

3.3 Service

WARNING: Do not attempt to repair the B801 Charge Controller. The charge controller contains no user-serviceable parts.

If the Pika B801 malfunctions or fails in any way, first contact Pika customer service at 1 (207) 887-9105 for troubleshooting help. See the Warranty section for details on terms and conditions for repair or replacement under warranty. You must obtain an RMA (Returned Merchandise Authorization) number prior to returning the unit. Obtain the assistance of a skilled and qualified installer to safely disconnect the charge controller for shipment.

Technical Support Information:

- Support department hours: 9AM to 5PM EST, Monday – Friday (excluding holidays)
- Phone: 1-(207)-887-9105 United States Language: English
- Email: support@pika-energy.com

4 The REbus™ Microgrid

The REbus™ Microgrid is the underlying technology that allows for the efficient and robust interconnection of different types of renewable energy products. This section is informational only and not required knowledge for operation of your Pika B801 Charge controller.

4.1 Simple and Efficient Power Distribution and Management

The REbus™ Microgrid architecture was designed with renewable energy in mind. A clean-sheet approach to power distribution resulted in the most practical and efficient interconnection technology available. The REbus™ Microgrid operates at variable voltage in a defined band, between +/- 180-200 V relative to ground which simultaneously allows for efficient power transmission, reduced shock hazard, and simplified electronics for a bidirectional converter such as the B801. The variable voltage communicates energy availability to the attached REbus™ devices, which allows for prioritized energy storage and load shedding. The REbus™ Microgrid is designed to support many different types of renewable energy sources and power converters, as well as accommodating future 380VDC REbus™ Microgrid loads that are presently in development.

4.2 Integrated Power Line Carrier (PLC) Communications

The REbus™ Microgrid standard also specifies an optional power line carrier communication technology that enables devices on the same REbus™ Microgrid to communicate with one another. The B801 uses this capability to gather information about your system such as the status and energy production of your Pika T701 Wind Turbine or your solar array, which connects to the REbus™ Microgrid through the Pika S2001 PV Link.

4.3 REbus™ Control Protocol (RCP)

REbus™ Control Protocol (RCP) is a communications protocol developed specifically for the transfer of data between REbus™-compatible power converters and data management products. RCP is an open-standard protocol which enables independent developers to interface with REbus™ products and create software and applications to enhance user experience. Please visit the Pika Energy website to learn more about RCP and the software applications that are currently available.

5 Designing a REbus™ System

Your trained and qualified installer will work with the Pika Energy technical support team to design the right system for your site. Please consult with Pika Energy sales department at (207) 887-9105 or on the web at http://www.pika-energy.com to find an installer near you.

The Pika Energy product system is designed from the ground up for unmatched flexibility. First and foremost, the B801 Charge controller accepts input from any combination of REbus™-compatible sources. In fact, the B801 supports up to 32 devices on the REbus™ Microgrid network, and the automatic power management capability of REbus™ ensures that excess input power from renewable sources such as the Pika T701 Wind Turbine or Pika S2001 PV Link will be throttled back to prevent over-charging of the batteries. As of publication, Pika Energy offers the following REbus™ products in addition to the B801 Charge Controller:

- T701 Wind Turbine
- S2001 PV Link
- X3001 Inverter
- REport Data Monitor

Check the Pika Energy website at http://www.pika-energy.com for the latest selection of REbus™ - compatible product offerings.

6. User Interface

6.1 Overview of User Interface

The B801 Charge Controller user interface is accessible via the LCD on the front cover. It is designed to provide basic information such as power, energy and battery voltage. Adjustable setpoints for the B801 and attached REbus™ devices can be changed from the LCD screen as well.

6.2 LED Displays

The B801 user interface is equipped with three LEDs to quickly offer information about the status of the charge controller and other REbus™ devices.

6.2.1 Multicolor "REbus™" LED

This green/yellow/red LED indicates the status of the REbus™ microgrid and attached devices. When solid green, all devices are functioning normally and are generating power. When solid yellow, devices are functioning normally but there is no power input from the REbus™ microgrid. When red, one or more of the REbus™ devices are in an error state and require attention before operation will continue. A red light could also indicate a fault with the REbus™ Microgrid itself (e.g. a ground fault). See the LCD Display for more information about the specific fault that has been detected.

6.2.2 Multicolor "Battery" LED

This green/yellow/red LED indicates the status of the B801 itself. If the B801 is Disabled (or powered OFF), the Battery LED will be OFF. The Battery LED will only be illuminated if the B801 has been Enabled.

When solid green, the B801 is functioning normally and is importing or exporting power to/from the REbus™ DC Microgrid. Blinking green indicates a state where the B801 is functioning normally but not importing or exporting power to/from the REbus™ DC Microgrid. When solid yellow, the B801 is in a "Waiting" state, no power is being imported/exported and no user input is required. After a timeout has expired the B801 will exit "Waiting" state and resume normal operation. When solid red, an error with the charge controller has been detected and user attention is required before the unit will resume operation. See the LCD Display for more information about the specific error that has been detected. Blinking red is displayed during an equalization cycle which is initiated by the user. Reference Section 6.3.2 B801 Charge Controller Page for LED state information.

6.2.3 Blue "Wi-Fi" LED

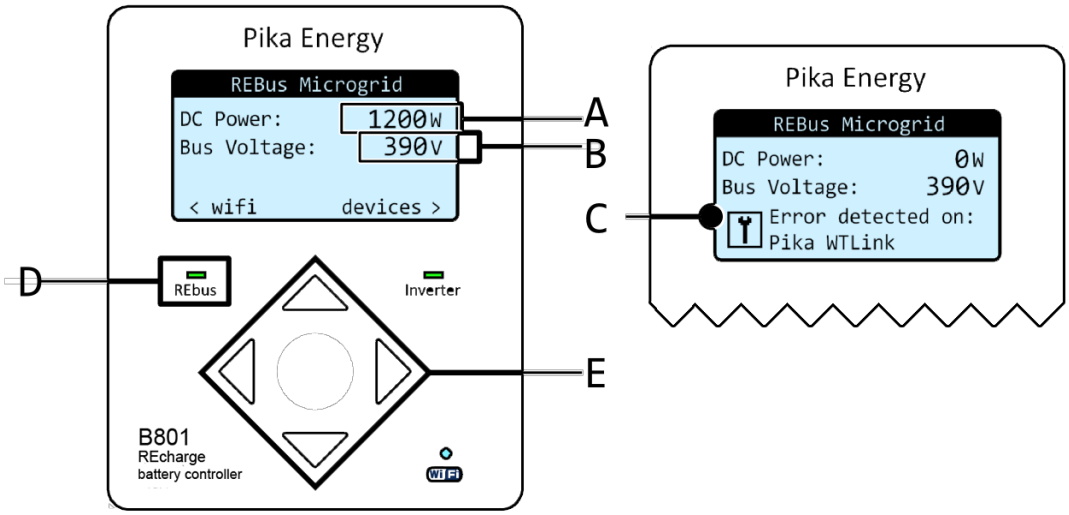
The blue LED is illuminated when a connection to a Wi-Fi router has been established and is operating normally. The blue LED is OFF if no Wi-Fi connection has been established.

6.3 LCD Display

The LCD display provides access to information about the B801 and other connected REbus™ devices. The display is organized into pages with three default pages and one additional page for each attached REbus™ device. Each device page allows the user to enable/disable the device. Additionally, user adjustable setpoints can be accessed using the LCD display.

6.3.1 REbus™ System Page

The REbus™ System Page gives an overview of the entire REbus™ DC Microgrid (displays voltage and DC power). This is the default page of the display and appears automatically on power up.



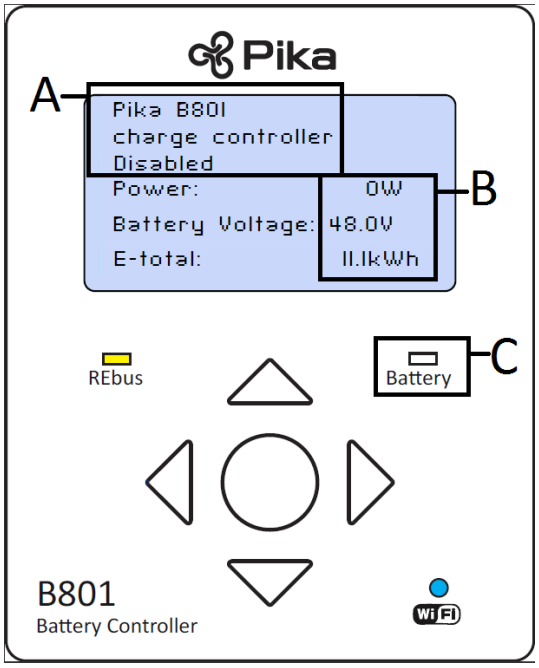
Position	Description	Explanation
A	REbus™ DC Power	The instantaneous power being generated by REbus™ sources. This is the amount of power being input into the REbus™ side of the B801.
B	Bus Voltage	The voltage of the electrical bus that connects all of the REbus™ devices to the B801. The normal range is 340 to 410 Volts.

C	REbus™ Device Error Notification	This message is displayed when a REbus™ device reports an error. The message indicates which REbus™ device requires your attention.
D	REbus™ Status Indicator LED	This LED describes the state of all of the REbus™ devices connected to the REbus™ DC Microgrid. The LED will be RED if one or more REbus™ devices are reporting an error, YELLOW if no power is being imported/exported, and GREEN if power is being imported/exported from the REbus™ DC microgrid. The color of the LED does not depend on the page that is currently displayed.
E	User Input buttons	These five buttons allow the user to scroll through display pages and command connected devices as well as the B801.

Button functionality when in a menu:	
Left	Exit menu or cancel menu selection before confirmation.
Right	Advance to see menu options
Up/Down	Change menu selection. Selected item will be highlighted.
Center	Select current highlighted menu item

Button functionality for REbus™ Information Page	
Left/Down	Scroll to the Wi-Fi information page.
Right/Up	Scroll to the B801 information page.
Center	No functionality on the REbus™ information page.

6.3.2 B801 Charge Controller Page

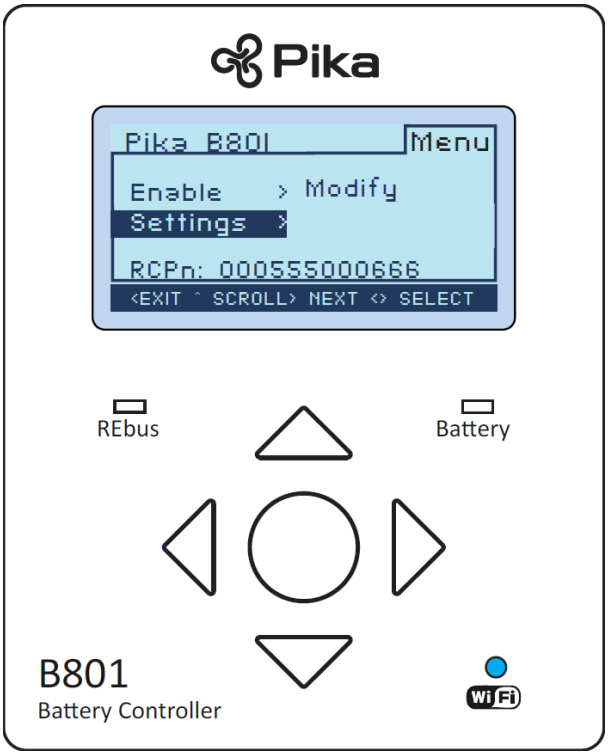


<table>
<tr><th>Position</th><th>Description</th><th>Explanation</th></tr>
<tr><td>A</td><td>B801 Status</td><td>The B801 displays its name and status at this location. Possible status messages:
<table>
<tr><td>Powering up</td><td>The B801 is powering up.</td></tr>
<tr><td>Disabled</td><td>The B801 has been disabled by the user.</td></tr>
<tr><td>Waiting</td><td>The B801 is waiting for a short period of time before energizing the REbus™ DC Microgrid.</td></tr>
<tr><td>Bulk Charging Battery</td><td>The B801 is importing power from the REbus™ DC Microgrid to bulk charge the batteries.</td></tr>
<tr><td>Absorption Charging Battery</td><td>The B801 is importing power from the REbus™ DC Microgrid to complete the charge cycle on the batteries.</td></tr>
<tr><td>Float Charging Battery</td><td>The B801 is importing power from the REbus™ DC Microgrid to maintain a complete charge on the batteries.</td></tr>
<tr><td>Standby</td><td>The B801 will display this message when it is waiting for power to be generated by your REbus™ devices.</td></tr>
<tr><td>Discharging Battery</td><td>The B801 is exporting power to the REbus™ DC Microgrid.</td></tr>
<tr><td>Equalize Charging Battery</td><td>The B801 is performing an equalize cycle on the batteries as initiated by the user.</td></tr>
<tr><td>ERR: General</td><td>An unspecified error has occurred. Please contact Pika Energy for assistance.</td></tr>
</table></td></tr>
<tr><td>B</td><td>DC Power, battery voltage and Energy display</td><td>The B801 displays the instantaneous power being imported/exported to/from the batteries as well as the current battery voltage. It also tracks the amount of energy that has been exported overall.</td></tr>
<tr><td>C</td><td>Battery Status LED</td><td>This LED provides an indication for the status of the B801 which is independent of the page that is currently displayed.
<table>
<tr><td colspan="2">Battery Status LED Color</td></tr>
<tr><td>Solid Yellow</td><td>Waiting</td></tr>
<tr><td>Blinking Green</td><td>Standby (Enabled but no power is currently being imported/exported)</td></tr>
<tr><td>Green</td><td>Enabled and importing/exporting power</td></tr>
<tr><td>Red</td><td>The B801 has reported an error and requires your attention</td></tr>
<tr><td>Blinking Red</td><td>Equalize charging cycle is in progress</td></tr>
<tr><td>Off</td><td>The user has disabled (or turned OFF) the B801</td></tr>
</table></td></tr>
</table>

Button functionality for battery charge controller information page	
Left/Down	Scroll to the REbus™ information page.
Right/Up	Scroll to the device information pages.
Center	Open the battery charge controller menu.

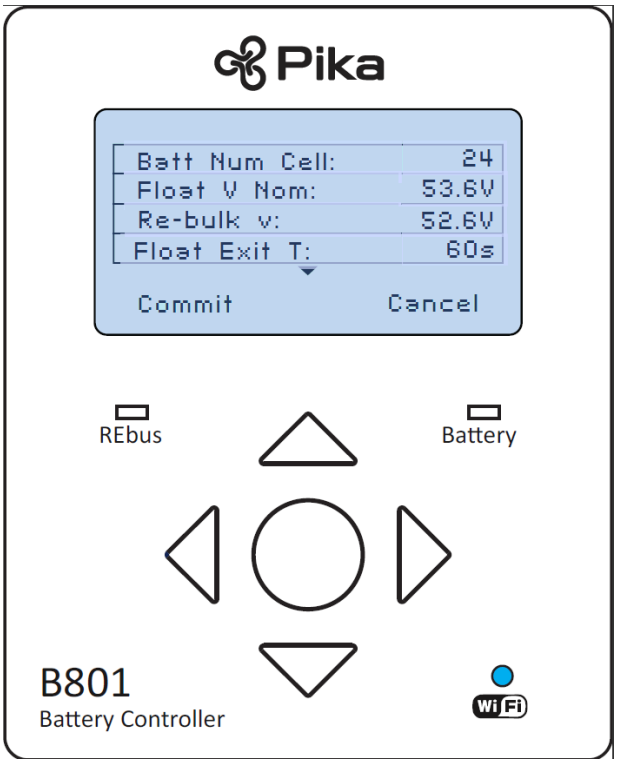
Menu Options:	
Enable/Disable	Instruct the charge controller to enable or disable.
Settings	Adjust setpoints for B801

Configuration of the B801 can be done from the Charge Controller page. **Always configure the B801 before Enabling it**. Press the center button to access the various options for the charge controller. From here, use the arrows keys to navigate. The B801 may be "Enabled" or "Disabled" and user adjustable setpoints may be entered by selecting "Settings" and then "Modify".



A brief message may be displayed while the setpoints load.

Once the setpoints are loaded, use the up and down arrow keys and press the center button to change a desired setpoint. When the bar turns solid, the setpoint is ready to be changed using the up and down arrow keys.



Holding the up or down button for a long press (2-3 seconds) will increment the setpoint much faster. Refer to *Table 1 User Setpoint Table* for a description of each setpoint as well as permissible ranges. Only after pressing "Commit" will all of the setpoints be saved. **NOTE** that if a setpoint was changed un-intenionally all changes can be discarded by navigating to the bottom of the setpoint lis and pressing cancel.

NOTE that changing the number of cells ("Batt Num Cell", setpoint #4) or the battery chemistry type ("Batt Type", setpoint #3) will automatically default the **ENTIRE** setpoint table after selecting **commit**. Any alteration to battery chemistry or number of cells in the setpoint table will cause the remainder of the table to default to different values for safety purposes. If making changes to battery chemistry or number of cells, commit changes after only changing setpoints #3 and #4 and re-enter the settings menu from the B801 device page before configuring the rest of the setpoints as described below.

To save time during initial B801 configuration, follow the steps below:

1. Navigate to *settings* from the B801 device page, select "Modify". This brings up the menu to edit the setpoints.

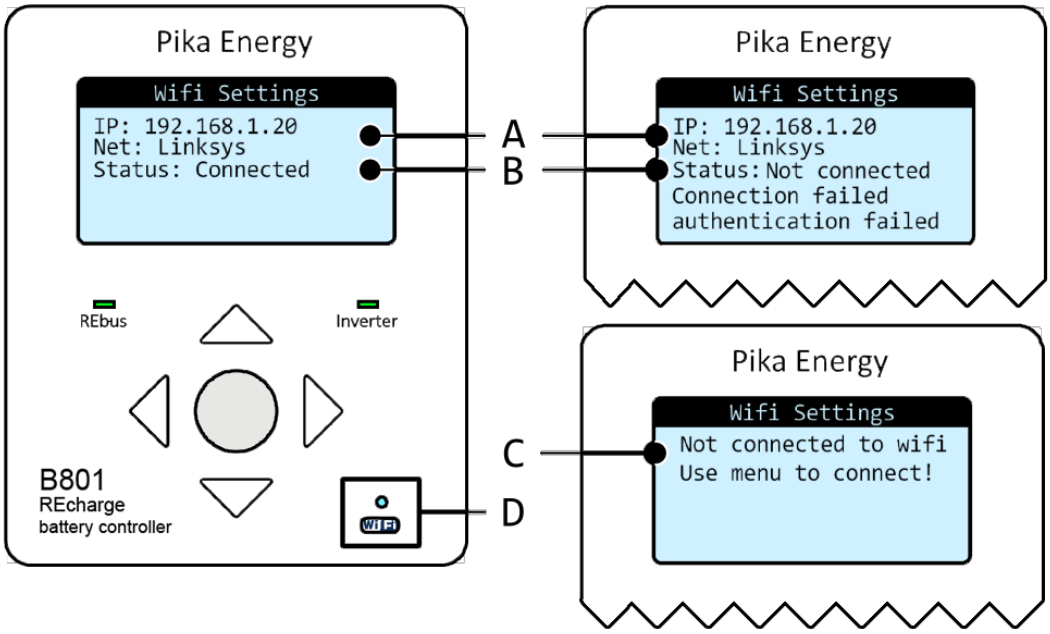
2. Select the correct battery type and number of cells (according to Table 1 User Setpoint Table)

3. Commit battery type and number of cells (scroll to bottom of menu, select "commit" and press center button)

4. Re-navigate to *settings* from the B801 device page, select "Modify" and configure all other B801 setpoints

5. Commit the setpoints by scrolling to the bottom of the menu, selecting “commit” by pressing the center button.

6.3.3 Wi-Fi Status Page

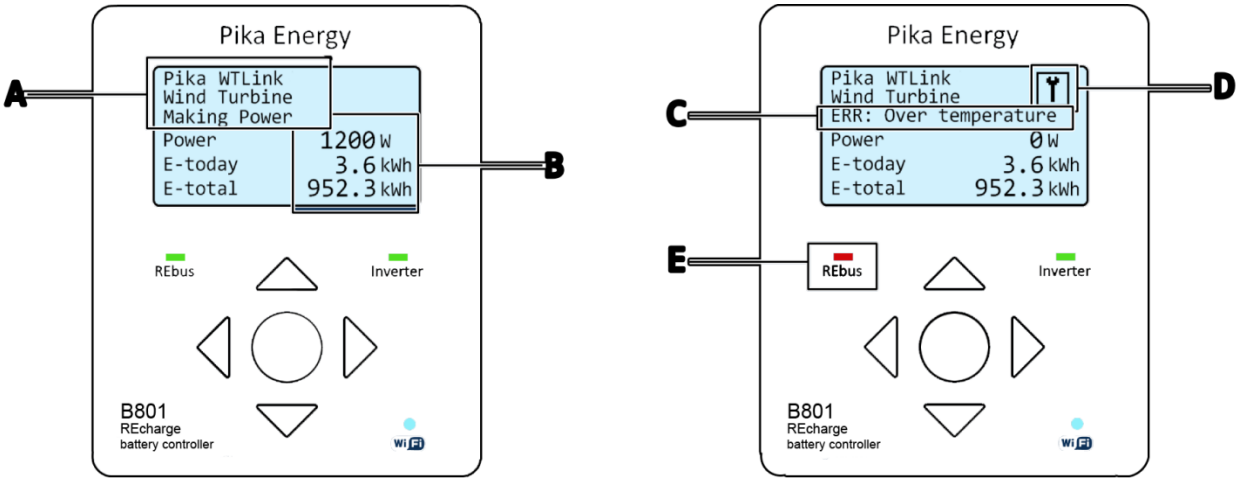


Position	Description	Explanation
A	Wi-Fi network and IP address	The B801 displays the Wi-Fi network and IP address that it has been assigned when configured to connect to a Wi-Fi network.
B	Wi-Fi Status	The B801 also displays the Wi-Fi connection status when configured to connect to a Wi-Fi network. The B801 will also print the reason for a failed connection. See section **8.3 Wi-Fi Status Messages and Troubleshooting** for descriptions of the connection status messages and troubleshooting information.
C	Wi-Fi settings not configured	This message is displayed when the B801 has not been configured to connect to a Wi-Fi network, or after the Wi-Fi settings have been reset from the Wi-Fi menu.
D	Wi-Fi activity LED	This blue LED will flash when the B801 is communicating on a Wi-Fi network.

Button functionality for Wi-Fi Information Page	
Left/Down	Scroll to the device information pages.
Right/Up	Scroll to the REbus™ information page.
Center	Open the device menu.

Menu Options:	
Setup	Set the Wi-Fi configuration settings.
Reset	Reset the Wi-Fi configuration settings and connection.

6.3.4 Other REbus™ Device Pages



Position	Description	Explanation
A	REbus™ Device Name, Type, Status	The B801 will display the name, device type, and status of each of the REbus™ devices.
B	REbus™ Device DC Power and Energy	The B801 also displays the instantaneous DC power being generated (or used) by this device. The total and daily amount of energy generated is also displayed.
C	Error State Message	When the device is in an error state, the B801 will display the error status here. Statuses are device-specific so please refer to the manual for REbus™ device for descriptions of the status messages and troubleshooting information.
D	Error Indication Icon	This icon provides an indication that this device needs attention.
E	REbus™ Status Indicator LED	This LED describes the state of all of the REbus™ devices connected to the REbus™. The LED will be RED if one or more REbus™ devices are reporting an error, YELLOW if no REbus™ devices are functioning normally but are not generating power, and GREEN if all REbus™ devices are functioning normally and generating power. The color of the LED does not depend on the page that you are looking at.

Button functionality for Device Information Page	
Left/Down	Scroll to either the next REbus™ device if there are more to view, or the Wi-Fi settings page.
Right/Up	Scroll to either the previous REbus™ device if there are more to view, or the charge controller information page.
Center	Open the device menu.

Menu Options:	
Enable/Disable	Instruct the charge controller to enable or disable itself.
Remove	Remove this device from the display. Only useful for clearing devices that you no longer have attached to the REbus™.

6.3.5 Background Illumination

The background light is typically turned off to conserve power, however, any time a button is pressed the background light will turn on to help illuminate the display. The background light will automatically turn off after 30 seconds of inactivity.

7 Operation

7.1 Installation

Please consult the Pika B801 Charge Controller Installation & Service Manual for instruction and important safety precautions related to the installation of your new charge controller. Anyone installing a B801 Charge Controller should follow the strict safety procedures and instructions provided in the Installation & Service Manual.

7.2 Power Switch

The power switch located on the bottom of the charge controller and can be used to turn your B801 ON and OFF. **High voltage may still be present inside the charge controller and at the terminals even when this switch is in the OFF position.** Note that disconnecting the battery bank (e.g. via a service disconnect or circuit breaker) may not turn the charge controller off if sources (e.g. wind or solar) are providing power to the REbus™ DC microgrid. **Always check for voltage on each terminal before performing any electrical service!**

7.3 Enable/Disable

Enable

To permit the B801 to import and export power while connected to the batteries, it must be enabled. Once enabled, the B801 will automatically return to importing and exporting power after an outage (power cycle or battery disconnection). To “Enable” the B801, navigate to the B801 page, press the center button, select “Enable” from the menu options and select confirm. The “disabled” state message will no longer be displayed on the B801 page.

Disable

To prevent the B801 from importing and exporting power while connected to the batteries, it must be disabled. Once disabled, the B801 will not import or export power until it has been enabled. To disable the B801 navigate to the B801 page, press the center button, select “Disable” from the menu options and select confirm. The “disabled” state message will be displayed on the B801 page.

When disabled but powered up, the B801 will remain connected to your local wireless network and still operate as a communications gateway for the REbus™ DC Microgrid.

7.4 Charging Stages

7.4.1 Terms

Terminology used in the description of the operation of the B801 is defined below.

Depth of Discharge (DoD)

The state of charge of the batteries can be 0% to 100% charged. The Depth of Discharge refers to how much of the total charge you will allow to be used before charging the battery bank back to 100% charge again. For example a 40% DoD would mean that when the batteries got down to 60% state of charge then the B801 would start to Bulk charge the batteries back to 100% state of charge (see Bulk charging section for more information on Bulk charging). In order to get the most out of your batteries every charge cycle you want to discharge them as much as possible. *However*, the lifetime of the batteries decreases as the DoD gets larger. Research your battery model specifications and assess your energy production and usage to make the choice that's right for you.

7.4.2 Bulk

Bulk charging occurs when the batteries are between the desired DoD and fully charged. During this stage the battery voltage rises to the "Bulk Voltage" and the battery bank voltage is held at the "Bulk Voltage" for a set amount of time. After the voltage is held at the "Bulk Voltage" for the set amount of time the B801 enters the Absorption charge stage.

7.4.3 Absorption

As the batteries near a complete charge, less and less current is required to maintain the same "Bulk Voltage". Absorption charging maintains the same "Bulk Voltage" as the bulk charging state while tapering down the amount of current into the batteries. After an allotted time has elapsed the current will have decreased significantly and charging will then enter Float charging stage, at this point the batteries are near a 100% charge.

7.4.4 Float

Float charging starts when the battery is close to a full charge, the B801 attempts to apply a constant float voltage, maintaining a near 100% charge. If the battery loads are consuming more power than the input power coming from the REbus™ DC Microgrid, then the battery voltage will decrease. When the battery voltage reaches the user defined "Re-bulk" voltage, the B801 will enter Bulk charging mode again. The B801 will always cycle through the three charging states: Bulk, Absorption and Float.

7.4.5 Equalize

After the battery bank experiences repeated charging cycles the individual cells that make up each battery become unbalanced, and some hold more charge then others. In order to maximize the lifetime and total energy storage of your battery bank you must "Equalize" the battery bank. Equalization brings all of the individual cells within a battery to the same voltage. This is done by holding the battery bank at a slightly higher voltage then the "Bulk Voltage". This does not harm the batteries in any way and it is part of typical battery maintenance. Equalization is initiated manually by the user and stops after the equalization time has elapsed. It is recommended to perform equalization periodically and during a

time with steady input power. Please check with the battery manufacturer about maintenance and equalization best practices. Ensure batteries have sufficient electrolyte levels before performing an equalization cycle.

7.5 Battery Voltage Limits

Battery systems often have multiple sources for battery charging such as a PV system and/or a generator. It is important that all these systems are configured with the same battery voltage setpoints so that each part of the system can perform the correct task at the correct time. The B801 is constantly monitoring the battery bank voltage, if it is out of a safe range the B801 will take action to prevent damage to the batteries. There are a variety of ways the B801 safely handles dangerous battery voltages.

7.5.1 Low Battery Voltage

A user adjustable low battery voltage setpoint determines the "Low Battery Voltage Threshold". For a 48V system the default Low battery voltage is 47V. For a 24V system the default Low Battery voltage is 23.5V.

The charge controller must draw a small amount of power to keep the REbus™ DC microgrid at 340V so that input devices such as the T701 Wind Turbine and the S2001 PV Link can still operate. During low battery voltage state, if there isn't any input power, the B801 will power-down the REbus™ DC microgrid to 0V in order to conserve power. The B801 enters a hibernation state and will wait a specified amount of time before bringing the voltage on the REbus™ DC microgrid back to 340V again. The "off" time and "on" time for when the REbus™ DC microgrid is at 0V or 340V are specified in the user setpoint table (refer to *Table 1 User Setpoint Table* for more information about setpoints).

7.5.2 Error Low Battery Voltage

The state "Error Low Battery Voltage" occurs if the batteries are depleted to the point where they may be damaged, rendering them unusable if they are discharged any further. Please check with the battery manufacturer about extremely low voltage conditions for your battery bank size. For a 48V system extremely low battery voltage is typically 45V. For a 24V system extremely low battery voltage is typically 22.5V. A user adjustable setpoint determines the extremely low battery voltage threshold. When the battery voltage is below this setpoint, the B801 will power down the REbus™ DC microgrid to conserve energy.

The only way to bring the REbus™ DC microgrid back up is to either manually disable/re-enable the B801 from the LCD user interface screen or to power the B801 OFF then back ON again with the power switch. After re-enabling, the B801 will power up the REbus one time, for the amount of time specified by the "Low Battery Time On" setpoint, to create an opportunity for a REbus source (e.g. wind turbine or solar panels) to start charging the batteries. If input power starts to charge the batteries, the REbus™ DC microgrid will stay powered up and continue to charge the batteries, otherwise it will power down again and stay off until the user performs another disable/enable cycle. Pika recommends that the user only override the "Error Low Battery Voltage" state when there is ample input power available from the sources (e.g. the wind is blowing or the sun is shining).

7.5.3 High Battery Voltage

In the event of a high battery voltage, the B801 will make an error and shutdown, user input is required and the B801 will not automatically return to normal operation. High battery voltage is at 65V and is to protect the circuitry of the B801 from being damaged. Note that the B801 will never charge a battery bank to 65V, however if an external source (e.g. a different charge controller) charges the batteries to this high voltage, then the B801 will shut down to protect itself.

7.6 High Temperature Operation

The B801 is designed and tested to operate continuously at full power in ambient air temperature up to 50ºC. However, installation in tight spaces (e.g. closets), direct exposure to full sun, or installations that hamper the effectiveness of the cooling system may result in higher charge controller temperatures and reduced power operation. While the charge controller has been designed to operate in these conditions without damage, the lifetime of the hardware will be longer when operated in a lower temperature environment. It is highly recommended that the charge controller be installed in a well-ventilated area, and out of direct sunlight if possible. See the Installation & Service Manual for further information on best practices for mounting the B801 to provide adequate ventilation.

7.7 Configurations

The B801 is designed with a number of user configurable options allowing customization for various battery chemistries and voltages. Recommended default setting are pre-programed into the B801. Setpoints should only be adjusted after careful consideration and system design. Always check with the battery manufacturers to determine the proper voltage levels. Misuse of these setpoints can result in poor performance and/or damage to the system. **NEVER change B801 setpoints while the B801 is enabled. ONLY change B801 setpoints when the B801 is disabled and no power is being imported/exported from the B801.** Always configure battery setpoints **before** enabling the B801. It is highly recommended that you record all setpoints on a piece of paper near the B801 for future adjustment and as a backup incase configuration settings are lost.

Note: On initial configuration of the B801, select Battery Type and Number of cells, commit those setpoints and re-enter the configuration menu.

Presented below in Table 1 is an overview of the setpoints available to the user.

Table 1 User Setpoint Table

Number	Setpoint	Description	Unit	Default	Minimum	Maximum
2	”PLC Channel”	PLC Channel	N/A	0	0	11
3	“Batt Type”	Battery Type	0-Custom 1-Flooded Lead Acid 2-Gel 3-AGM	1 (Lead Acid)	0	3

4	"Batt Num Cell"	Number of Battery Cells	# of 2V cells within battery bank	24	12	24
5	"Float V Nom"	Float Voltage Nominal	Volts	53.6	0	65.0
6	"Re-bulk V"	Re-bulk voltage	Volts	48.0	0	65.0
7	"Flt Ext T"	Float Exit Time	Minutes	60	1	360 (6hrs)
8	"Bulk V Nom"	Bulk Voltage Nominal	Volts	58.4	0	65.0
9	"Blk Exit T"	Bulk Exit Time	Minutes	60	1	360 (6hrs)
10	"Eq. V Nom"	Equalize Voltage Nominal	Volts	62.0	0	65.0
11	"Eq. Exit T"	Equalize Exit Time	Minutes	60	1	360 (6hrs)
12	"Dchrg V Min"	Discharge Voltage Minimum	Volts	47.0	0	60.0
13	"Abs V Min"	Absolute Voltage Min	Volts	45.0	0	60.0
14	"Batt T Co"	Battery Temp Coefficient	milliVolts/ Celsius/Cell	5	0	100
15	"Batt T No"	Battery Temp Nominal	Celsius	25	0	65.0
16	"Mx Chrg Cur"	Max Charge Current	Amps	80	0	80
17	"Mx Dchrg Cur"	Max Discharge Current	Amps	80	0	80
18	"Vlow T off"	Low Battery Time Off	Seconds	600	2	3600(1 hour)
19	"V low T on"	Low Battery Time On	Seconds	90	2	3600 (1 hour)
20	"Rly V On"	Relay Turn On Voltage	Volts	50.0	12.0	65.0
21	"Rly Hyst V"	Relay Voltage Hysteresis	Volts	2	0.5	65.0
22	"Rly Hyst T"	Relay Time Hysteresis	Seconds	10	10	3600 (1 hour)

2) PLC Channel: Reserved

3) <u>Battery Type:</u> Allows the user to select the correct battery chemistry. Select **"0"** for custom batteries, **"1"** for flooded lead acid, **"2"** for Gel cell batteries and **"3"** for AGM lead acid batteries. After changing this setpoint a default set of values for the chosen battery chemistry will be loaded onto the B801 upon saving the setpoints. If you wish to change any of the setpoints to be custom you should select **"0"** for custom batteries. **Note** that the setpoints will not be loaded to the screen immediately,

you must commit the setpoints first and then go back into the modify setpoints menu to see the updated values.

4) Number of Battery Cells: This is the number of cells that are connected in series for your battery bank. Each cell of a battery makes up 2V of the total battery bank voltage. For example a 48V battery bank has 24 cells, a 36V battery bank has 18 cells and a 24V battery bank has 12 cells. Selecting the number of cells and type of battery will determine the system voltage. **Be sure that this setpoint is correct!**

5) Float Voltage Nominal: Determines the nominal voltage that the B801 will control to when in the "Float" charging state.

6) Re-bulk Voltage: Determines the battery voltage at which to enter the "Bulk" charging state. This setpoint determines Depth of Discharge of your battery bank. Please consult the manufacture for an optimal value for "Re-bulk Voltage" setpoint for your system.

7) Float Exit Time: Sets the amount of time that the B801 will remain in the "Float" charging state when the voltage falls below the "Re-bulk voltage" setpoint before entering the "Bulk" charging state.

8) Bulk Voltage Nominal: Determines the nominal voltage that the B801 will control to when in the "Bulk" charging state.

9) Bulk Exit Time: The amount of time the B801 will remain in "Bulk" and "Absorption" before returning back to float. The B801 will stay in "Bulk" state for half of this amount of time and in "Absorption" state for the other half of this specified time.

10) Equalize Voltage: Determines the nominal voltage that the B801 will control to during the equalization process.

11) Equalize Exit Time: The amount of time in minutes the B801 will apply the "Equalize Voltage" during the equalization process.

12) Discharge Voltage Minimum: The low voltage limit of the batteries, above which the B801 will still source power to loads. Below this voltage the B801 will enter a hibernation state (see "Low Battery Time Off" and "Low Battery Time On" setpoint descriptions for more details).

13) Absolute Voltage Minimum: The absolute voltage limit, below which damage may be caused to the batteries if discharged any further. If this setpoint is reached the B801 will power down the REbus™ DC Microgrid, and remain OFF pending user intervention. The user must disable and then enable the B801 using the LCD screen or power cycle the B801 with the power switch in order to resume operation after this type of shutdown.

14) Battery Temp Coefficient: This setpoint is provided by the battery manufacturer and should be entered as millivolts per degrees Celsius per cell.

15) Battery Temp Nominal: Sets the nominal battery temperature entered in degrees Celsius, consult with the battery manufacturer for more information.

16) Max Charge Current: Sets the absolute maximum current supplied by the B801 during charging.

17) Max Discharge Current: Sets the absolute maximum current when discharging power from the batteries for REbus™ loads.

18) Low Battery Time Off: Sets the amount of time the B801 will remain in hibernation when the battery voltage is below "Discharge Voltage Minimum". See *Section 7.5 - 7.5.1 Low Battery* Voltage for more detailed information.

19) Low Battery Time On: Sets the amount of time the B801 will hold the REbus™ DC Microgrid to 340V and attempt to start "Bulk" charging the batteries. See *Section 7.5 - 7.5.1 Low Battery* Voltage for more detailed information.

20) Relay Turn On Voltage: This is the battery voltage at which the relay will turn "ON". This means that the normally closed contact will open, and the normally open contact will close. In the "OFF" state the normally closed contacts will be closed and the normally open contacts will be open.

21) Relay Voltage Hysteresis: After the relay is "ON" it will stay in that state until the voltage drops below the "Relay Turn On Voltage" minus this setpoint. This setpoint is the voltage difference between "Relay Turn On Voltage" and what would be the "Relay Turn Off Voltage". For example if you set your "Relay Voltage Hysteresis" to be 2V and your "Relay Turn On Voltage" is set to 50V then the relay will turn on at 50V and off at 48V.

22) Relay Time Hysteresis: The minimum amount of time that the relay must remain OFF after being ON. Regardless of what the battery voltage does after it dropped below the threshold (Relay Turn Off Voltage minus Relay Voltage Hysteresis) the relay will stay OFF for this specified amount of time. This protects whatever is connected to the relay from frequent switching ON and OFF.

8 Internet Compatibility

The Wi-Fi features of the B801 are entirely optional and can be connected/disconnected in the settings menu, accessible from the LCD screen. Note that in order to receive firmware upgrades and to use the Pika REview™ online monitoring system (See section 8.4 Pika account and the REview™ online monitoring system) you must be connected to the internet.

At Pika Energy, we believe that people make better energy decisions when their energy information is depicted in an easy to understand and intuitive format. For this reason, the B801 is designed to display its vast amount of energy information on a Pika-supported website called REview™ for visualization and analysis. The website offers the user several graphical options for viewing his or her energy production. These include energy (kWh) plotted monthly and daily for 30 years, hourly for the previous year and by minute for the past 24 hours.

The website also provides status reports, event logging and graphics of the energy production for each component of the system. After connecting your B801 to the internet, log on to http://profiles.pika-energy.com/ to make an account, register your hardware and setup your REview page.

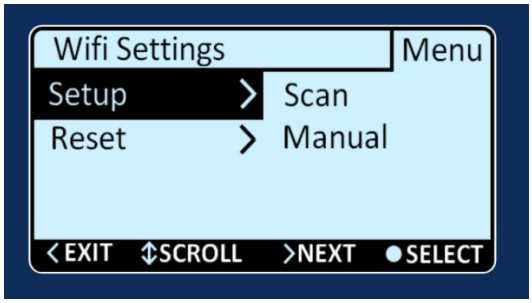
8.1 Wi-Fi Antenna

The Pika B801 is shipped standard with a Wi-Fi antenna that should offer good performance for most installations within 150 feet of a wireless router. For installations where the charge controller is located at a large distance from the Wi-Fi router, the signal strength may not be adequate. Signal strength can be monitored on the Wi-Fi Page of the LCD Display (see Section 6.3.3). In this case, a higher-gain antenna can be purchased to improve the connection to the Wi-Fi router. Most electronic component suppliers offer compatible antennas with SMA connectors. Most 802.11 antennas with SMA connectors (available from electronic component distributors) will be compatible. For alternate antenna suggestions contact Pika Energy.

8.2 Configuring your Wi-Fi Connection

This section will describe how to connect the B801 to your Wi-Fi network.

The B801 Wi-Fi connection is IEEE 802.11G compliant and connects to 802.11b/g/n routers with WEP, WPA-PSK, and WPA2-PSK security protocols. *Note: While WEP encryption is nominally supported, it has been problematic on wireless networks running older WEP enabled hardware.*

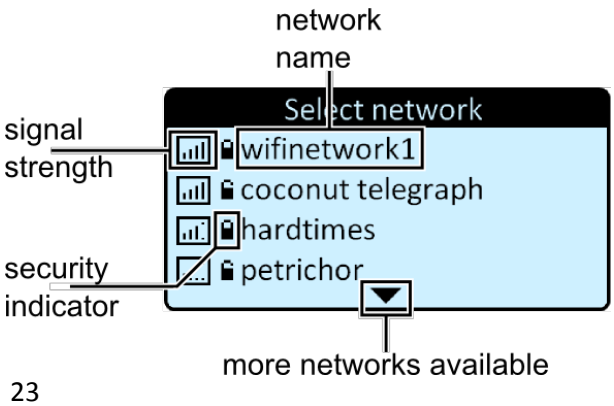


Step 1: Navigate to the Wi-Fi information page and press the center button to open the menu.

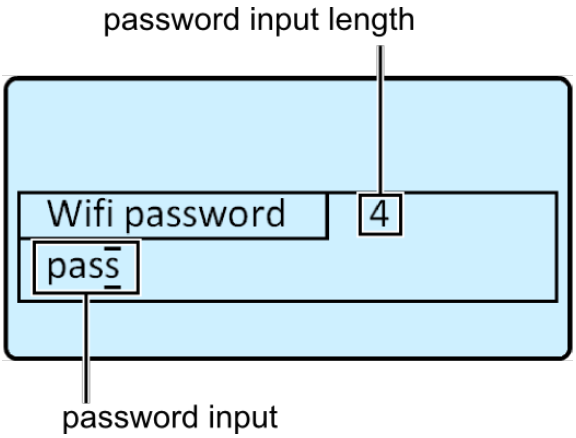
Step 2: Choose whether you want the B801 to scan for the Wi-Fi networks or enter your Wi-Fi network parameters manually. For most networks using DHCP, simply scan, enter the network password and connect. If manual configuration is desired, selected the "Advanced" option, select "Manual" and enter an IP address, Subnet Mask, DNS and Gateway. For some institutions, it is necessary to create an IP address reservation before connecting to the network. Contact your network administration for information on how to reserve an IP address. Enter advanced configuration information (if required) before connecting to the network.

8.2.1 Scan-based network setup

(Scan) Step 3: If you choose "Scan", the B801 will scan for networks and display the results with indicators for signal strength and network security. Use the **UP** and **DOWN** arrows to select your network. Press **LEFT** to cancel the Wi-Fi configuration process. Press **CENTER** to



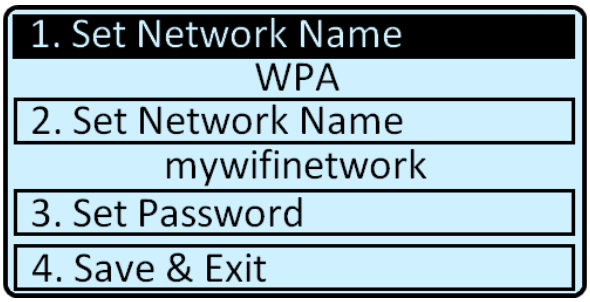
select the highlighted network. The B801 will then ask you for your Wi-Fi network password if your network is secured.



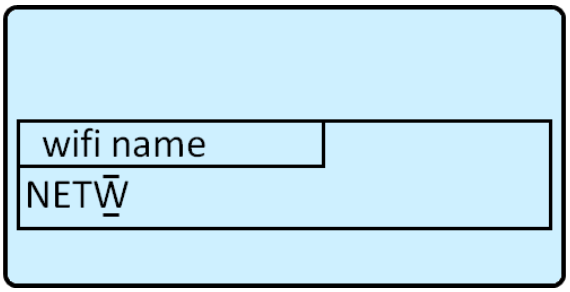
(Scan) Step 4: Enter your password by using the **UP**/**DOWN**/**LEFT**/**RIGHT** buttons. **RIGHT** and **LEFT** will change the cursor position. **UP** and **DOWN** will change the character at the cursor position. Press **CENTER** when you have finished entering your password. The B801 will immediately try to connect to your network with the provided password.

8.2.2 Add network setup

(Manual) Step 3: If you choose "add", you will be shown the manual network setup screen shown below. Press **UP** and **DOWN** to select and **CENTER** to perform the highlighted item.

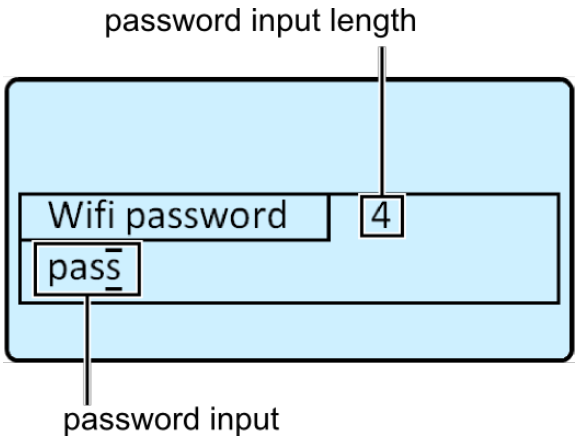


(Manual) Step 4: Enter your network type. If your network is secured with a password, consult your wireless network router to determine whether your network is WEP or WPA security. If your network is WPA or WPA2, choose the WPA option. Choose OPEN if your network does not use a password.



(Manual) Step 5: Enter your network name by using the **UP**/**DOWN**/**LEFT**/**RIGHT** buttons. **RIGHT** and **LEFT** will change the cursor position. **UP** and **DOWN** will change the character at the cursor position. Press **CENTER** when you have finished entering your network name. You will be brought back to the Manual network setup screen.

(Manual) Step 6: Enter your password by using the **UP**/**DOWN**/**LEFT**/**RIGHT** buttons. **RIGHT** and **LEFT** will change the cursor position. **UP** and **DOWN** will change the character at the cursor position. Press **CENTER** when you have finished entering your password. You will be brought back to the Manual network setup screen.



(Manual) Step 7: Select "Save & Exit" to apply your Wi-Fi network settings. The B801 will then attempt to connect to your network with the provided configuration. Once the B801 is connected to a network, it should automatically re-establish a connection to the network if a service interruption occurs (loss of internet connection). If this fails to happen, the status "Offline" will be displayed on the B801 on your REview page. If your network name and password haven't changed, simply power cycle the B801 using the switch on the bottom of the unit. Upon power up the B801 will remember your network information and reconnect.

8.3 Wi-Fi Status Messages and Troubleshooting

8.3.1 Connection states:

"Status: Connected"	The B801 has successfully connected to your Wi-Fi network.
"Status: Not connected"	The B801 was unable to connect to your network. The additional information displayed will describe why it was unable to connect
"Status: Connecting"	The B801 is in the processing of negotiating with your Wi-Fi network.
"Status: Reconnecting"	The B801 was temporarily disconnected and is attempting to renegotiate with the Wi-Fi network. No user input is required.

8.3.2 Connection state messages:

"Connection failed network join failed"	This message is displayed when the B801 has failed to connect to your Wi-Fi network but not enough information is available to determine a specific reason. In many cases this is due to poor receiver reception on the B801. Try moving your Wi-Fi router closer to the B801.
"Connection failed authentication failed"	This message will be displayed when the B801 is refused by your Wi-Fi router because of an incorrect password. Re-enter your credentials to try again, passwords may be case sensitive.
"Connection failed association failed"	This message will be displayed when the B801 was able authenticate itself with your network, but your router refused to let the B801 connect. This usually means your router has been specifically configured to block the B801 from connecting. Check your router configuration and remove it from any device block lists.
"Connection failed handshake failed"	This message will be displayed when your router and B801 have failed to exchange encryption information. This can be caused by data corruption due to noise. Sources of this noise are microwave ovens, wireless phones, and other sources of 2.4 GHz radio. If this happens repeatedly try moving your Wi-Fi router closer to the B801.
"Connection failed Security mismatch"	This message will be displayed if the B801 has been configured to use the wrong type of Wi-Fi security. If you manually selected "WPA" as your network type, try using "WEP" instead. If you manually selected "WEP," try "WPA."
"Connection failed no suitable AP found"	This message will be displayed if the B801 was unable to find your network after scanning. Double check that your network name is correct. If the network name is correct, the B801 might be out of range of your Wi-Fi network. Try moving the Wi-Fi router closer to the B801.

"Connection temp lost AP beacon timeout"	This message is displayed when the B801 has failed to receive the "heartbeat" message that all Wi-Fi routers send. This can happen if your Wi-Fi router is being reset, powered down, or is just beyond the signal range to the B801. The B801 is still attempting to reconnect automatically when this message is displayed.
"Connection temp lost Deauth received"	This message indicates that your Wi-Fi router has told the B801 to disconnect and re-authenticate itself. The B801 will attempt to reauthorize and reconnect.
"Connection temp lost Disassociate received"	This message indicates that your Wi-Fi router has told the B801 to reconnect. The B801 will attempt to reconnect automatically.

"Conn permanently lost AP beacon timeout"	This message is displayed when the B801 has failed to receive the "heartbeat" message for a long period of time. This can happen if your Wi-Fi router is powered down or is just beyond the signal range to the B801. The B801 has given up trying to connect to your Wi-Fi network when this message is displayed.
"Conn permanently lost Deauth received"	This message indicates that your Wi-Fi router has told the B801 to repeatedly re-authenticate itself. This indicates an unusual authorization issue between your Wi-Fi router and the B801. Try re-entering your network configuration on the B801.
"Conn permanently lost Disassociate received"	This message indicates that your Wi-Fi router has told the B801 to repeatedly reconnect. This indicates an unusual authorization issue between your Wi-Fi router and the B801. Try re-entering your network configuration on the B801.

8.4 Pika account and the REview™ online monitoring system

Use the device ID card for each piece of hardware you received to register it to your REview page by logging on to http://www.profiles.pika-energy.com/ to set up your Pika account. Once you have created an account and registered your hardware, you will be able to view information about your Pika REbus™ system from anywhere in the world! If you have lost or misplaced your device ID cards e-mail support@pika-energy.com to receive registration information for your hardware. For more information refer to the REview quickstart guide that came with your B801 Charge Controller.

9 Included Hardware and Auxiliary Functionality

Mutltiple items are included with the B801 that are important to getting the most out of your system. Accessories included with the B801 ensure optimal performance these include the Wi-Fi antenna and battery temperature probe. There are also auxiliary functions of the B801 which can be used in conjunction with accessories that are not included.

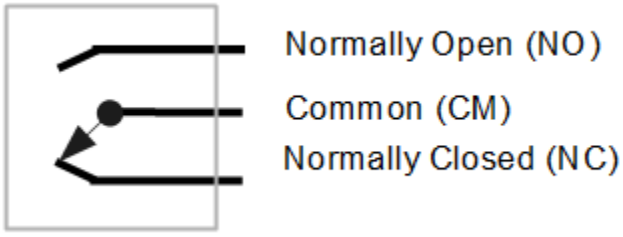
9.1 Auxiliary Functionality

The B801 supports three external auxiliary functions to supplement normal operation. These functions are an auxiliary relay, current shunt sensor and battery temperature sensor (included). All of these auxiliary functions are accessed via the 7 pin wiring terminal in the wiring compartment depicted below.

7 Pin Wiring Terminal

9.1.1 Auxiliary Relay

The auxiliary relay is controlled by the B801 and actuates according to the battery voltage as specified by the “Rly V On” setpoint. This relay has a normally closed and normally open contact. The three terminals on the relay are: common (marked CM), normally open contact (marked NO) and the normally closed contact (marked NC).



Relay functional diagram

The relay allows the user to command external devices to perform an action dependent on battery voltage. For example, this relay can be wired into the automatic start functionality on a generator and when the battery voltage gets below the “Rly V On” setpoint the relay will actuate, which then starts the

generator in order to charge the batteries when they are depleted. The relay may also be used to control a dump load. The setpoints can be adjusted such that when the battery voltage is high the relay closes, which when wired to a dump load controller can turn on a load such as a hot water heater element in order to use excess energy when it is available.

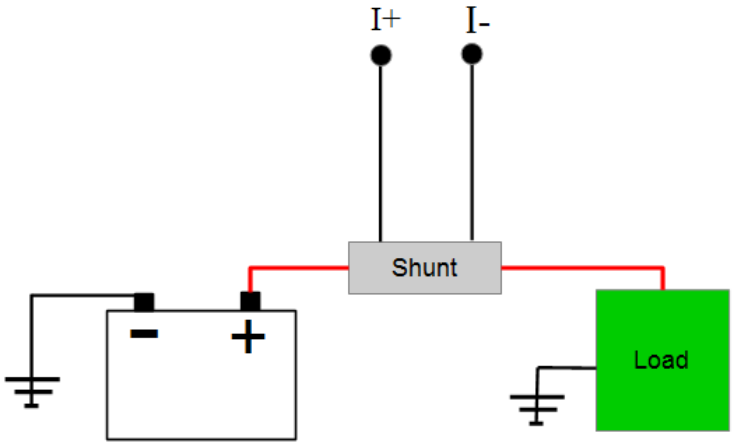
WARNING: Do not exceed the specified current and voltage rating of the auxiliary relay! Do not drive dump load directly using this relay! For relay specifications reference the B801 Installation Manual.

See setpoints 20-22 in Table 1 User Setpoint Table for more information on how to configure relay settings.

9.1.2 Current Shunt Sensor

The B801 supports an external current shunt for measuring battery current. The current shunt sense wires are connected to I+ and I-. The B801 supports any 250µΩ (micro-ohm) current shunt. If you would like to use a current shunt with a resistance value other than250µΩ please contact Pika Technical service.

The direction of current flow will determine whether the shunt measurement is positive or negative. Connecting I+ to the terminal on the shunt closest to battery positive will result in current entering the batteries as a positive current measurement. Reference the diagram below to show this configuration. To reverse this sign convention simply reverse the sense wires to I+ and I-. **NOTE** the current shunt should ***only*** be wired on the battery positive wire, **NOT** the battery negative wire, as depicted in the diagram below.



Current Shunt diagram

9.1.3 Battery Temperature Probe

When batteries are not stored at a constant room temperature environment it is important to compensate for the change in temperature. This is done by sensing battery temperature using the provided temperature probe. **NOTE:** ***Do not disconnect your battery connections under load. Consult a trained professional before you install the battery temperature probe.*** This probe attaches directly to a battery terminal lug to sense the temperature of the batteries. The two wires that come out of the

probe attach into the 7 terminal wiring block inside the wiring compartment of the B801. The temperature sensor is not polarized; the red or black wire may be wired into either "T" labeled connection on the 7 wire terminal block. The battery temperature probe is depicted below.

Battery Temperature Probe

As batteries increase in temperature, charging setpoints should be appropriately compensated to avoid overcharging. This compensation factor is given the units of mV/C/Cell. A typical compensation factor is anywhere between 0-5 mV/C/Cell. This means that for every degree C above nominal temperature (typically set at 25C) the charging voltage is adjusted by some number of mV for every cell in your battery bank.

Example:

Temperature compensation to be 5mV/C/Cell for a 48V battery bank, therefore there are 24 cells. Nominal battery temperature setpoint is set to 25C. It is a hot day and the batteries are at 35C. The float voltage is set to 53.6V and bulk voltage is set to 58.4V. The battery temperature is therefore 10C hotter than it typically is and float and bulk voltage setpoints should be adjusted accoringly. The B801 will automatically calculate your new float voltage setpoint to be:

$$New\ Float\ Voltage = 53.6V - 24\ [Cells] * 5\left[\frac{mV}{C\ per\ Cell}\right] * 10[C] = 53.6 - 1200mV = \ 52.4V$$

This compensation is also applied to the bulk voltage resulting in a new bulk voltage of 57.6V. This compensation helps to not abuse the batteries on hot days and to increase their lifetime. The same process applies for when the batteries are cold, except the voltage is compensated such that the float and bulk votage setpoints increase instead of decrease.

9.3 WiFi Antenna

The WiFi antenna gets installed on the bottom of the lid cover as shown below. Ensure that your WiFi antenna is screwed on tightly and is secure. The picture below depicts the bottom of the B801 Charge Controller.

WiFi Antenna Installation

9.4 Device ID Card

This card allows you to register for Pikas free REview service. REview is an internet web page that allows you to see your instantaneous power production as well as daily energy production plotted in chart form. Each Pika device comes with a device ID card and needs to be registered on the Pika website in order to see your devices on REview. See the included REview quickstart guide for information regarding registering your devices.

10 Maintenance

In general the Pika B801 does not require any regular maintenance. Periodically ensure that nothing is blocking the flow of air through the heatsink fins to prevent from thermally limiting the unit. If a hardware failure of the B801 has occurred, contact Pika technical service for information on how to obtain a replacement unit.

10.1 Battery Maintenance

Refer to the manufacturer's guidelines for how to keep your batteries in good shape. Monitor cell water levels if applicable and perform periodic equalization charges to maximize lifetime of the battery bank. Inspect terminals for corrosion and clean with terminal brush. Ensure adequate ventilation of the battery box is present at all times. Do not connect unbalanced loads to the battery bank (eg. wiring a 24V load to half of 48V bank), this will prematurely deteriorate those batteries and cause the bank voltage to decrease below normal voltage thresholds, causing unintended behavior of the B801.

10.2 Handling Errors and Faults

Refer to the troubleshooting guide (Section10) if your system is not behaving as expected. Disabling and then enabling the B801 will clear all faults and errors. If your system is chronically reporting any fault or error, contact Pika technical service for advice/assistance on troubleshooting the issue.

11 Troubleshooting Guide

Refer to the table below for guidance on how to troubleshoot your B801. If you are experiencing a symptom not addressed in this guide or require further assistance, contact Pika Energy for technical support at (207)-887-9105 or via e-mail at support@pika-energy.com

Symptom	**Action**
Unit does not power up	1) Check that Battery Voltage in the range of 24-48VDC is present across the battery input terminals. 2) Toggle the power switch on the bottom side of the inverter 3) Verify breaker to B801 is in the ON position 4) Verify power switch harness is plugged into board
Ground Fault	1) Turn off the DC breaker between the batteries and charge controller. Verify no voltage is present on battery input terminals and REbus™ wiring. Disconnect the REbus™™ (DC) side wiring and ensure it is not touching anything. Power ON the inverter and make sure the ground fault message is no longer displayed. 2) Check the wiring on the REbus™ (DC) side. Ensure that none of the DC wires are touching the enclosure or earth ground wires. RE+ and RE- should measure >1MΩ to ground with a multimeter. Some possible scenarios: incorrect REbus™ wiring, lightning arrestor failed, chaffed wire insulation, or broken wire.
Unit displays waiting state	1) Some fault conditions warrant a timeout, if the unit does not return to normal operation after 10 minutes contact technical service.
LCD Screen displays solid black or solid white	1) Turn the unit off using the power switch on the bottom, wait 1 minute and turn it back on again. 2) If operating in cold temperatures the LCD may be slow to respond but will increase responsiveness once warmed up.
Charge controller display does not show connected REbus™ devices OR connected devices have status “offline” although the charge controller is operating.	1) Check that ground wire on REbus™ side is connected to the lug in the wiring compartment. There must be a continuous ground wire from the B801 to the device for communications to work properly. 2) Reseat the cable that attaches the LCD screen to the main board within the B801. Note this is a polarized connector. It may be dislodged during shipping or installation. 3) Call technical support for further troubleshooting.
Charge controller shows devices that are no longer connected to REbus™	1) Delete unwanted or disconnected devices by selecting “Remove” under the device page. Devices

	are automatically discovered but must be manually removed.
Devices on REbus™ (turbine, PV, etc) are shutting down frequently (multiple times a day)	1) Check the battery voltage of your system, the batteries may be fully charged and the devices are limiting their power output as to not overcharge the batteries. 2) A generator or other source is pushing battery voltage high causing the REbus™ devices to limit their output power.
Charger will not come out of low battery voltage state	1) Check to ensure the B801 is configured for the appropriate battery bank voltage 2) Verify batteries are not damaged by measuring voltage with a multimeter
The B801 is showing a different battery voltage than other hardware I have on my system.	1) Calibration between different manufacturers may vary. Ensure wires to the batteries are as short as possible and connections are tight. 2) Verify battery voltage with a calibrated voltmeter and adjust hardware to match it.
The battery setpoints I entered are no longer saved!	1) To save battery setpoints be sure to select "Commit" at the bottom of the page, otherwise sepoints will revert to their previous values 2) Changing the battery type or number of cells will cause the remaining setpoints to revert to their default values for that battery type and voltage. Remaining setpoints should be re-entered after changing either battery type or number of cells.

12 Frequently Asked Questions

Where do I go to see my REview page?

To make a REview account and register your hardware visit http://profiles.pika-energy.com. Collect all device ID cards which will be needed for registration. Consult the REview quickstart guide for more information regarding registration. If you have lost your device ID card contact support@pika-energy.com to receive the correct registration code for your hardware.

I have two 48V systems in parallel, does that mean I have to enter 48 cells in my settings?

The number of cells entered into the settings is used to calculate nominal voltage of your battery bank, which accounts for how many cells that are in **SERIES**, **NOT** the number of cells in **PARALLEL**. For a battery bank with 48V the correct number of cells is 24. For a 24V battery bank the correct number of cells is 12. While a battery bank that has two 48V banks in parallel technically has 48 cells, the parallel cells are dis-regarded.

Why is my B801 is not regulating exactly to the voltage setpoints I configured?

If you are using the included temperature probe, the B801 will change the voltage setpoints slightly according to the battery temperature. This temperature compensation is normal and helps ensure proper charging to maximize lifetime of your batteries. If you are ***NOT*** using the battery temperature probe, it recommended that the temperature compensation setpoint (setpoint #14) is set to 0.

My B801 does not read the same battery voltage as other charge controllers on my system, why?

The B801 uses a precise measuring circuit to monitor battery voltage, you can measure the battery voltage using a calibrated instrument at the B801 terminals and verify the reading is correct. Long wire runs to the battery bank can cause excessive voltage drop. It may be appropriate to adjust other charge controllers on the system to match the B801 so all equipment will operate in the same charging modes.

13 Specifications

Electrical

Rating Name	Min	Max	Units
Maximum REbus™ DC Microgrid voltage	-	420	V
REbus™ DC Microgrid operating voltage range	360	410	V
Maximum REbus™ DC Microgrid input current	-	10	A
Maximum REbus™ DC Microgrid output current	-	10	A
Operating battery voltage range (DC)	24	48	V
Maximum continuous DC charging battery current	-	80	A
Maximum continuous DC discharging battery current	-	80	A
Maximum continuous DC charging power at 50C	-	4000	W
Maximum continuous DC discharging power at 50C	-	2800	W
Ambient temperature	-20	60	C
Full-power operation temperature range	-20	50	C
Peak Efficiency	-	97.0	%

General

Specification	Description	Units
Enclosure Type	Indoor	-
Enclosure Material	Powder-Coated Steel	-
Thermal Management	Internal Fan with intelligent temperature control	-
Weight	11 (25)	kg (lb)
Size (excluding antenna)	370 wide x 357 high x 148 deep (14.6 x 14.0 x 5.8)	mm (in.)
Battery Wire Size	0-6	AWG
Warranty	5 years standard	-

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